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VAUGHAN (J. A.). **Toxic hydrocarbons. Properties of hydrocarbons as related to their wood preserving value.**—*Industr. Engng Chem.*, 41, 3, pp. 526–530, 3 graphs, 1949.

Research conducted for the past ten years or more at the Southern Wood Preserving Company, Atlanta, Georgia, in an attempt to ascertain the causes underlying the toxicity of certain hydrocarbons, has led to the development of controls which may be employed in the production of toxic hydrocarbons from any source of hydrocarbon material. The studies have further shown that the presence of aromatic hydrocarbons and an established specific gravity–boiling point relationship may be used as a means of predicting toxicity towards fungi.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, 60, 5, pp. 251–256, 7 figs., 1949.

In the first part of this paper brief, practical directions are given for soil sterilization by means of steam, formalin, chloropicrin, and D.D., with notes on the cost of the different treatments.

In the second part a list is given of the hosts on which *Sclerotinia sclerotiorum* has been recorded [cf. *R.A.M.*, 24, p. 253; 28, p. 546] with brief notes on the symptoms and control of the disease on citrus, passion fruit vines [*Passiflora edulis*], and vegetables and other plants in New South Wales.

STEUDEL (W.). **Untersuchungen über die Vergilbungskrankheit der 'Beta'-Rüben im Rheinischen Zuckerrübenanbaugebiet 1947.** [Investigations on the yellows disease of '*Beta*' beets in the Rhenish Sugar Beet growing area in 1947.]—*NachrBl. biol. ZentrAnst. Braunschw.*, 1, 1, pp. 10–11, 1949.

In 1947 the general spread of the beet yellows virus in the Rhineland [*R.A.M.*, 14, p. 549] was from north to south. Violent outbreaks in the northerly part of the sugar beet growing area in July or early August were followed by a gradual spread southwards. *Doralis* [*Aphis*] *fabae* constituted well over 90 per cent. of the total aphid population on seed-bearers and an average of 80 per cent. on field crops. This species would appear, therefore, to be of considerable importance in the primary diffusion of the virus from seed-bearers to field crops, particularly since the alates appeared earlier and were more numerous on the latter than those of *Myzodes* [*Myzus*] *persicae*, the only other aphid found regularly visiting beets.

CALVERT (O. H.), POUND (G. S.), WALKER (J. C.), STAHMANN (M. A.), & STAUFFER (J. F.). **Induced variability in Phoma lingam.**—Abs. in *Phytopathology*, 39, 6, p. 495, 1949.

Induced variability of the Puget Sound [Washington State] strain of *Phoma lingam* recently described as occurring on cabbage seed plants [*R.A.M.*, 27, p. 305] has been studied in relation to a sudden development of seed transmission on local seed. To determine whether this black leg [canker] epidemic resulted from

increased activity of the Puget Sound strain, nitrogen mustard (methyl-bis β-chloroethylamine) was used to induce cultural and pathogenic variability. In one experiment over 60 per cent. of mutations occurred among surviving spores. Greenhouse inoculations were made to ascertain the extent of induced pathogenic variability by nitrogen mustard (the most effective of the treatments tested for this purpose). None of the isolates produced lesions characteristic of those of the eastern type strains, but some were able to cause an equally severe disease. However, no conclusive evidence was forthcoming to explain the sudden development of canker transmission on western-grown seed.

SYLVESTER (E. S.). **Beet-mosaic virus–green Peach aphid relationships.**—*Phytopathology*, 39, 6, pp. 417–424, 1949.

The following conclusions were reached as a result of experiments at the University of California, Berkeley, on the transmission of the beet mosaic virus [*R.A.M.*, 28, p. 431] by the green peach aphid [*Myzus persicae*: ibid., 27, p. 54]. The acquisition and inoculation thresholds [ibid., 28, p. 433] were found to lie between 6 and 10 seconds, with a mean transmission threshold value (the minimum determinable period required for a single vector to transmit a virus from a disease source to a healthy plant) of about one minute. A pre-infection-feeding, starvation period of two to five minutes is essential. Aphids starving after an infection feeding begin to lose their capacity to transmit the virus within two minutes, but the loss is apparently greater after 15 minutes. The efficiency of the vectors can evidently be doubled, or possibly trebled, by increasing the number of punctures from one to five. The longer the test feeding period, therefore, the more potential punctures can be effected, with a consequent increase in vector efficiency.

The following are among the points to be considered in connexion with any project for halting the spread of a virus of this type: the degree of infestation, the normal activity of the insects involved, the type of population, especially in relation to the number of winged forms present, and the potential results of any control programme on population movement and general restlessness.

COOK (R. L.). **Symptoms of nutritional disorders in Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 318–328, 2 col. pl. [one as frontispiece], 7 figs., [? 1949].

In this survey the availability of nitrogen, phosphorus, potassium, manganese, boron, calcium, magnesium, and iron in sugar beet soils is discussed and the symptoms in beets due to deficiency of any of the nutrients are fully described and illustrated from experimental and field-grown plants in Michigan.

AFANASIEV (M. M.). **Effect of fertilizers on diseases and yield of Sugar Beets planted in depleted soil.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 294–299, [? 1949].

Investigations carried out from 1941 to 1945 on depleted land at the Huntley Branch Station, Montana, demonstrated that the fertility of soil has a great effect on yield, seedling disease [*R.A.M.*, 27, p. 402], stand, and top-to-root ratios of sugar beets, as in accordance with results elsewhere [ibid., 25, p. 148; 27, p. 1]. Plots fertilized with a complete fertilizer (treble superphosphate, plus nitrogen in two applications, plus manure) produced 75·8 per cent. healthy seedlings, those treated with nitrogen alone 44·7, and untreated plots 27·8.

AFANASIEV (M. M.). **Effect of seed treatments on seedling diseases of Beets planted in the greenhouse in highly infected soil.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 520–522, [? 1949].

The results of greenhouse tests at Bozeman, Montana, in 1947 with U.S. 215 × 216 sugar beet seed treated with various chemicals and planted in soil in which there

had been a high proportion of seedling disease, *Aphanomyces cochlioides* [see next abstract] being the most important pathogen under Montana conditions, confirmed previous findings [*R.A.M.*, 27, p. 1] that seed treatment has hardly any effect on the control of seedling diseases. The percentage of healthy seedlings from treated seed was very low, 7·7 to 42·6 in the first planting and 0 to 1 in the second, and 0 to 1·3 in another experiment, whereas untreated seed sown in well fertilized soil produced 98·4, 92·2, and 97·1 per cent. healthy seedlings in the same three trials [see preceding abstract].

Doxtator (C. W.) & Downie (A. R.). **Progress in breeding Sugar Beets for resistance to Aphanomyces root rot.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 130–136, 2 figs., [? 1949].

Sugar beet lines obtained in Minnesota from a 1946 selection resistant to *Aphanomyces cochlioides*, the chief causal organism of beet black root [*R.A.M.*, 28, pp. 150, 556, and next abstracts], and grown for seed at Rocky Ford, Colorado, were compared with three susceptible commercial varieties in a moderately severely infested field at Mason City, Iowa, in 1947. The open-pollinated, bulked progeny of the best selections, 6–404a, yielded 8 tons per acre, the susceptible varieties an average of 1·6 tons. Of 195 selected open-pollinated progenies 46 were selected for resistance; 13 of these were found highly resistant particularly under severe disease conditions at Waseca, Minnesota.

Bockstahler (H. W.) & Reece (O. E.). **Progress report on breeding of Sugar Beets in Minnesota for resistance to black root.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 136–141 [? 1949].

The results of field tests carried out in Minnesota in 1947 [see preceding and next abstracts] showed that 34·6 per cent. of sugar beet progenies from seed produced in the greenhouse by the polycross method yielded $1\frac{1}{2}$ to 3 times as many healthy roots as the variety U.S. 216 in a field heavily infested with the black root organism *Aphanomyces cochlioides*. Seventeen per cent. of the progenies from mother beets planted in the field exceeded U.S. 216 in numbers of healthy roots.

Gaskill (J. O.), Bockstahler (H. W.), & Reece (O. E.). **Comparative reaction of Sugar Beet strains to black root in field tests at Blissfield, Michigan, and Waseca, Minnesota, in 1947.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 142–150, 2 figs., [? 1949].

Field trials were carried out in 1947 at Blissfield, Michigan, and Waseca, Minnesota, under relatively severe black root conditions [see preceding abstracts] with seed of 19 inbred sugar beet strains derived from U.S. 216 in the United States Department of Agriculture breeding project for resistance to leaf spot (*Cercospora beticola*) [see below p. 613] and 43 seed lots with black root resistance from the Minnesota programme. They varied considerably in their resistance to black root, but most strains reacted similarly at the two locations; the contradictory reaction of certain strains, however, stresses the importance of testing breeding material and promising new strains in various localities and under different conditions of disease exposure.

Murphy (A. M.), Owen (F. V.), & Ryser (G. K.). **New Sugar Beet strains from U.S. 22 with higher curly-top resistance.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 179–180, [? 1949].

As a result of selection, under conditions of heavy infection, from U.S. 22/2 (the second release of U.S. 22), the strain U.S. 22/3 possesses a considerably higher resistance to beet curly top [virus: *R.A.M.*, 27, p. 1 and next abstract] and

is being propagated for commercial use. Further selections from this strain, designated S.L. 61 and S.L. 62, yielded under very severe curly top conditions at Jerome, Idaho, in May 1947, 16·51 and 16·29 tons per acre, respectively, as compared with 6·47, 10·78, and 15·85 tons for U.S. 22, U.S. 22/2, and U.S. 22/3, respectively. In a later planting of these varieties in June, when curly top infection was higher, S.L. 62 showed the greatest resistance.

GIDDINGS (N. J.). **Some studies of curly-top virus in the field.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 531–538, 2 figs., [? 1949].

The general predominance of the less virulent curly top virus strains in collections of sugar beet leafhopper [*Eutettix tenellus*: *R.A.M.*, 27, pp. 213, 344] made in the winter breeding areas in California and Idaho may be explained by the fact that the more virulent strains rapidly kill a high percentage of annual winter hosts. Young beets are excellent hosts for both virus and vector, and there is a great increase of the highly virulent virus in such fields, because infected beets live relatively much longer than infected winter annuals.

Leafhoppers collected from resistant sugar beets [see preceding abstract] carried about 10 per cent. less curly top virus than those collected from susceptible varieties [ibid., 25, p. 285]. The average incubation period of virus transferred by leafhoppers from susceptible varieties to healthy plants was 11·4 days, while that from resistant beets was 17·2 days.

LEACH (L. D.). **Spray treatment of Sugar Beet seed.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 514–519, [? 1949].

To eliminate the unpleasant effects on operators of fungicidal dust during sugar beet seed treatment against damping-off [*R.A.M.*, 27, p. 2], an effective method has been devised which gives equal protection with dusts and is superior to the slurry method, because it provides more uniform seed coverage. Soluble fungicides or water suspensions of wettable fungicides with a suitable adhesive binder are sprayed through nozzles on to the seed during agitation in a rotating container.

Spray applications with arasan SF, wettable phygon, and ceresan M gave adequate seed protection in moderately infested soils. The degree of protection afforded by arasan SF and phygon increased with increased dosage up to 1 per cent., although the difference between 0·5 and 1 per cent. was not great. A 0·25 ceresan M application gave a very good control, but appeared to delay and reduce emergence. In heavily infested soil wettable phygon and ceresan M were more effective than arasan SF.

DOWNIE (A. R.). **Cooperative Beet seed treatment tests, 1947.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 523–527, [? 1949].

Of 14 sugar beet seed (U.S. 215 × 216) treatments with various chemicals, 12 resulted in significantly better stands than the untreated seed at Beltsville, Maryland, but only one of the 14 was significantly better than untreated at Huntley, East Grand Forks, Mason City, Fort Collins, and Saginaw. At eight of the 17 locations there was no significant increase due to seed treatment. At Chaska, Minnesota, 11 of the 14 treatments resulted in significantly reduced stands compared to non-treated seed. Seven treatments resulted in reduced stands at Fort Collins, Colorado, and one at Longmont, Colorado. It is suggested that the relatively poor performance of the treated seed may be due partly to initial high germination (90 per cent.). Another factor was the low incidence or absence of post-emergence damping-off [see preceding abstract].

Although the paucity of positive results makes generalizing extremely hazardous, there is some indication that 5 per cent. arasan gave slightly better results in the nine tests where there were significant differences.

Coons (G. H.), Stewart (D.), Bockstahler (H. W.), Deming (G. W.), Lill (J. G.), Nuckols (S. B.), & Reece (O. E.). **Report on 1947 tests of U.S. 215 × 216, and of other varieties from Sugar Beet leafspot resistance breeding investigations of the United States Department of Agriculture.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 166–174, [? 1949].

Four new sugar beet varieties and U.S. 215 × 216, resistant to *Cercospora* leaf spot [*C. beticola*: *R.A.M.*, 26, p. 575; 27, p. 225] were compared in trials in 17 sugar beet areas of Ohio, Colorado, Iowa, and Montana with a high yielding, European variety, S.P. 4–5–0, and the locally grown Nebraska 30. In five trials in which leaf spot was a factor the sugar production of the resistant varieties was about 9 to 15 per cent. greater than that of the non-resistant ones. Where the disease was of minor importance, no significant differences were observed. The leaf spot resistance in American bred varieties has been improved over European ones and this is considered their main advantage. Breeding of highly productive, leaf spot resistant varieties is in progress. The tetraploid variety S.P. 4511–00, which shows such promise, is being considered for release to the sugar beet industry. S.P. 451034–0, a synthetic variety, was also outstanding under leaf spot infection; it is hoped that its parent, SP. 3–1834–00, will be formally released as U.S. 226.

Dahlberg (H. W.) & Brewbaker (H. E.). **A promising Sugar Beet hybrid of the Milpitas wild type × commercial.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 175–178, [? 1949].

Wild beets, closely similar to *Beta maritima*, from Milpitas, California, which showed a marked resistance to leaf spot (*Cercospora*) [*beticola*: *R.A.M.*, 21, p. 400 and preceding abstract], were crossed in Colorado in 1937 with commercial Great Western 3718. The F_5 selection, named B 332, possessed an outstanding resistance to the disease, combined with good sugar production and other desirable characters. The leaf spot ratings of B 332 and the commercial GW 85 in 1946 were 1·5 and 4·7, respectively, and of B 332, GW 85, and GW 59 in 1947 were 1·2, 3·2, and 4·7, respectively.

Stewart (D.). **The damages induced by a severe epidemic of Cercospora leafspot on susceptible and resistant varieties of Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 528–530, [? 1949].

In a test conducted during the summer of 1947 at the Plant Industry Station, Beltsville, during a prolonged and unusually severe epidemic of beet leaf spot (*Cercospora beticola*) [see preceding abstracts] induced by natural infestation plus inoculation, the disease injury of the test sugar beet varieties was assessed, using a scale 0 to 10 (maximum injury). U.S. 15 (susceptible) received a score of 5 to 9 and Improved U.S. 216 (highly resistant) 0·5 to 3; Line J and U.S. 215 × 216/2 (classed as resistant) were intermediate with 1 to 4 and 2 to 5, respectively. Half of each varietal plot received eight applications of Bordeaux mixture at eight to ten day intervals, while the other half was left untreated. The increases in percentage stand and sucrose and in acre yield of gross sugar and roots in the sprayed were highly significant. With the possible exception of Improved U.S. 216 the quality of the roots from the unsprayed beets was below acceptable commercial standards.

Thus, under extreme leaf spot conditions even resistant varieties suffer significant reduction in yield and quality, and the need for further improvement in disease resistance is stressed.

Price (C.), Owen (F. V.), & Carsner (E.). **A new Sugar Beet variety, U.S. 56, for fall and winter planting in California.**—*Proc. Amer. Soc. Sug. Beet Technol., 1948*, pp. 181–186, 2 figs., [? 1949].

The new variety U.S. 56 represents a synthetic mixture of curly top resistant

material derived from several sources, one of which had moderate downy mildew [*Peronospora schachtii*: *R.A.M.*, 27, p. 224] resistance. U.S. 56 is decidedly superior to U.S. 15 in curly top resistance [see above, p. 611], about equal in downy mildew resistance, and slightly more resistant to bolting. Under moderate to very severe curly top exposures in California in 1947 it outyielded U.S. 15 by wide margins in tonnage of beets and sugar per acre; when the disease was not a factor, the performances of both varieties were about equal. U.S. 56 is recommended for autumn and winter planting in inland areas of California, where curly top may be a factor, and in coastal districts where both curly top and downy mildew may be prevalent.

Reid (W. D.). **Control of halo-blight of Beans.**—*N.Z.J. Sci. Tech.*, A, 30, 1, pp. 45–48, 1948. [Received August, 1949.]

In 1945–6 and 1946–7 further spraying tests against halo blight (*Pseudomonas medicaginis* var. *phaseolicola*) [*P. phaseolicola*: *R.A.M.*, 25, p. 199; 27, p. 116; 28, p. 151] were carried out in New Zealand, in which Masterpiece dwarf beans [*Phaseolus vulgaris*] were given two, three, and four applications of cuprox (5 lb. per 100 gals. water) or of Bordeaux mixture (6–8–100) applied with a knapsack pump at equal intervals from seedling stage to picking (36 days). The amount of spray given ranged from ¾ gal. per area of 74·6 sq. yds. for the first application to 3 gals. for the last.

An artificial epidemic was induced by using infector plants and by application of a bacterial suspension after the first spray had dried. On 23rd January, 1946, 19 days after inoculation, the unsprayed plots showed an average infection index of 3·2, as against 0·4 to 0·5 for the Bordeaux and 0·6 to 0·9 for the cuprox plots. The pods harvested from the unsprayed plots showed 14·2 per cent. infection on 7th February and 8·9 on 18th February, the treated plots averaging 0·2 and 0·05 per cent. infection for these two picking dates, respectively. The differences between the treatments were not significant. Green pod yields ranged from 186 oz. per plot in the controls and three- and four-spray cuprox treatments to 216 oz. for the two-spray Bordeaux, a difference which was just significant at the 5 per cent. level.

In the 1946–7 tests, after two applications of cuprox the infection index on 13th January, 1947, was 0·3 with pod infection of 1·48 per cent. for the picking on 21st January and 21·58 per cent. on 27th January; the pod yields were 408·6 oz. per plot and the seed yields (26 February) 37·3 oz. per plot. The corresponding figures for three applications were 0·2, 0·23 per cent., 10·91 per cent., 390·1 oz. and 33·1 oz., and for four 0·1, 0·22 per cent., 6·43 per cent., 365·9 oz., and 34·7 oz. With Bordeaux mixture the corresponding figures for two applications were 0·9, 2·23 per cent., 27·94 per cent., 412·4 oz., and 39·8 oz., for three were 0·1, 0·45 per cent., 10·59 per cent., 376 oz., and 38·4 oz., and for four 0·1, 0·26 per cent., 8·77 per cent., 394·8 oz., and 37·8 oz., while for the untreated controls they were 4·1, 75·58 per cent., 56·88 per cent., 204·9 oz. and 4·1 oz.

These results show that halo blight of beans can readily be controlled by spraying with Bordeaux mixture or cuprox. At least three applications are advisable, and the intervals between them should be adjusted to afford protection from the seedling stage to crop harvest.

Chiu (W. F.) & Walker (J. C.). **Morphology and variability of the Cucurbit black rot fungus.**—*J. agric. Res.*, 78, 5–6, pp. 81–102, 5 figs., 1 graph, 1949.

During 1945, a study was made at the Wisconsin Agricultural Experiment Station, of the variability of the morphology and cultural characters and the development of the fructifications of the cucurbit black rot fungus [*R.A.M.*, 25, p. 23] isolated from vines of Hawkesbury watermelons growing near Merrimac, Wisconsin.

Two types of pycnidia were obtained, one producing small, continuous (micro-) spores and the other larger (macro-) spores. The size of pycnidia on naturally infected watermelon stems varied from 50 to 150 μ, and those on culture media from 60 to 330 μ according to the strain and the medium. Most of the pycnidiospores obtained from naturally infected material were non-septate and measured 2·5 to 4·5 by 5 to 10 μ. The microspores were generally unicellular and in the different variants and on different media ranged from 1·5 to 5 by 3 to 10 μ. The macrospores, produced only by strains obtained from single ascospores, varied from 5 to 7 by 9 to 13 μ; in strain *B–1a* they were mostly uni- and occasionally biseptate, while in strain *B–a* they were mostly non-septate. In a reisolate of *B–1a* type from overwintering watermelon stems, all pycnidiospores were uniseptate. There was no relation between size of pycnidium and the size of the spore produced and the pycnidia producing the different types of spore were indistinguishable morphologically except for the size and septation of the pycnidiospores produced. The two types of spore did not appear to differ in function and there was no evidence that they functioned as spermatia.

The perithecia from watermelon stems measured from 90 to 120 μ while from the variants *As* (a single pycnidiospore isolate producing abundant pycnidia), *B–a* and *B–1a* on oatmeal-dextrose agar they measured 75 to 125, 78 to 190, and 70 to 230 μ, respectively. For the asci the measurements were 6 to 10 by 56 to 70 μ; 8 to 10 by 55 to 88 μ, 6 to 9 by 65 to 80 μ, and 8 to 12 by 55 to 80 μ, and for the ascospores 4·5 to 6 by 8 to 15 μ; 5 to 7 by 12 to 15 μ; 6 to 9 by 12 to 15 μ, and 5 to 7·5 by 11 to 15·5 μ, respectively. The fascicled asci were hyaline and each ascus contained eight bicellular, fusiform ascospores in either one or in two series. Many mature perithecia were studied. No paraphyses were found among the asci. A perithecium-like fruiting body was always found associated with the perithecia in agar cultures and was usually produced slightly earlier than the perithecia. These bodies were indistinguishable from the true perithecia in shape, colour, and size (110 to 160 μ) but produced within spores in chains, which separated later. These spores were uni- to tri-, but mostly biseptate, hyaline, nearly spherical, and measured 6 by 7 to 6 by 19 μ. They were discharged from the fruiting body together with granular material. Since the internal structure of the fructification was distinct from that of the perithecium, the name pseudo-perithecium was applied. Both ascospores and pycnidiospores were uninucleate. Monosporic lines were homothallic.

The wild type, *As*, was extremely variable and mutated spontaneously. *B–a*, *B–1a*, and *B–1b* (single ascospore culture) sporulated profusely and produced mycelium sparsely. Dextrose combined with peptone in any kind of medium favoured vigorous mycelial growth and produced an olive-green submerged mycelium. Peptone induced a salmon to purplish-brown colour. Sterile strain *A* sporulated on oat-paste agar and after irradiation of a well developed culture on potato dextrose agar for 15 minutes.

The confusion in earlier literature regarding the taxonomy and nomenclature of this organism is probably due largely to its pleomorphism. The earlier reports of paraphyses in the perithecium result from erroneous interpretations of immature or abortive asci.

In view of the priority of the name *Ascochyta cucumis* [ibid., 2, p. 342], the name of the perfect stage is designated herein as *Mycosphaerella cucumis* (Fautr. & Roum.) n. comb., syn. *Mycosphaerella citrullina* and *Didymella melonis*.

Rodigin (M. N.). О распространении **Gloeosporium lagenarium (Pass.) Sacc. et Roum.** воздушными течениями. [On the spread of *Gloeosporium lagenarium* (Pass.) Sacc. & Roum. by air currents.]—Микробиология [*Microbiology*], 17, 5, pp. 355–361, 1948. [Received June, 1949.]

Because of the constitution of its fructification *Gloeosporium* [*Colletotrichum*]

lagenarium [*R.A.M.*, 15, p. 698], the agent of anthracnose in melons and vegetable marrow, is unable to liberate its conidia from the sticky spore masses in which they are produced. Experiments with the aid of aeroscopes and glass slides, however, demonstrated that conidia of the fungus are present in the air and are dispersed with the wind. They descend with dew or rain. Dew which moistens the whole fruit surfaces is responsible for the so-called 'dry' anthracnose, while rain, which washes away the conidia, causes their accumulation in the lower parts, and is responsible for the 'wet' anthracnose. The source of infection comes from the overwintering sclerotia in infected vegetable remains, the fungus developing the conidial state in spring under favourable conditions.

HARE (W. W.), BAIN (D. C.), & ASHLEY (T. E.). **Fungicidal control of Cercospora blight of Pepper.**—Abs. in *Phytopathology*, 39, 6, p. 496, 1949.

A field of [chilli] pepper almost totally defoliated by *Cercospora capsici* was observed in the canning area of Mississippi on 23rd July, 1948, and from that date until the end of September sprays and dusts were applied fortnightly in replicated plots. A month after the final treatment a disease rating of the plants was made, based on the percentage of defoliation of the second crop of leaves. Analysis of indices calculated for each plot showed highly significant effects of Bordeaux (4–4–50) and copper A sprays as compared with the dusts in the prevention of defoliation, though copper A and tribasic copper dust were highly significantly superior to the controls [cf. *R.A.M.*, 19, p. 507]. The sprays gave satisfactory control of the disease, whereas the results obtained with the dusts did not justify their use in practice.

CROSIER (W. F.), PATRICK (S. R.), HEIT (C. E.), & MCSWAIN (ELIZABETH). **The harefoot Mushroom, Coprinus lagopus Fr., on fruits used commercially as seedstocks.**—*Science*, 110, 2844, pp. 13–14, 1949.

During germination tests at Cornell University, New York, and at the State College, New Mexico, sporophores of the saprophyte *Coprinus lagopus* developed on fruits of European-grown New Zealand spinach [*Tetragonia expansa*] and seed balls of garden beet and other plants. The mycelium of the fungus was apparently borne within the floral parts but not within the seeds.

'Red Geotrichum' a new invader of Mushroom beds.—*Mushroom News* (W. Darlington & Sons, Ltd., Worthing, Sussex), 2, 1, pp. 12–13, 3 figs.; 2, pp. 20–21, 1949.

Mushroom-growers in England have reported recently several cases of infestation of both casing soil and compost by a new fungus, known among them as 'red *Geotrichum*', but assigned by the Commonwealth Mycological Institute to the genus *Sporendonema*. The specific name has still to be determined. The mycelium invades the soil and may reduce the crops in size and quality.

The fungus is characterized by a cottony growth of dense, white, creeping hyphae. Later, the mycelium turns pink and at the final stage forms deep pink, powdery patches. The septate, sparsely branched hyphae are 3·25 to 4 μ broad; the cell contents become progressively denser with age and [surrounded by] thickened walls, while the hyphal walls become increasingly hyaline, leading to the intercalary formation of chlamydospores. These spores are barrel-shaped and measure 3·4 to 6·8 μ by 4·5 to 5·1 μ (average 4·63 by 4·9 μ).

It appears that in most instances the organism is introduced with the compost. Its effect on crop yields is not yet known, as the reports on this point differ widely. The author, who inspected a large number of infected beds, has seen no evidence of the mould seriously affecting mushroom production.

Preliminary observations indicate that the growth of the fungus is favoured by poor ventilation, high humidity, excessively high temperatures during the period of initial spawn growth (temperatures exceeding 70° F. should be avoided), and excessively alkaline conditions. Affected beds should not receive lime.

This question of Verticillium.—*Mushroom News* (W. Darlington & Sons, Ltd., Worthing, Sussex), 2, 2, pp. 22–24, 1 pl., 1 fig., 1949.

In this popular account the symptomatology of the mushroom brown spot fungus (*Verticillium psalliotae*) [*R.A.M.*, 28, p. 2] is given and that of the various diseases with which it is often confused. Since 1938, when the large scale, all the year round mushroom cultivation was adopted, brown spot has become one of the most common diseases of cultivated mushrooms. Outbreaks are particularly severe in mild, foggy weather. Prior to that date *Pseudomonas tolaasi* [ibid., 14, p. 346] appeared to be the only agent causing brown spot, and it is suggested that the more virulent cases of the disease may be the result of a combined attack of the two organisms.

Vitoria (E. R.), Ceresa (M. C. D.), & Alcalde Lassalle (A. J.). **Método para valorar el ataque de la Peronospora de la Vid.** [A method for the evaluation of Vine *Peronospora* infection.]—*Rev. Invest. agric., B. Aires*, 1, 4, pp. 261–268, 1 graph, 1947. [English summary.]

A method is outlined whereby the intensity of vine downy mildew (*Peronospora*) [*Plasmopara viticola*] can be determined statistically. The accuracy of the procedure was established by means of the analysis of variance. The yield and the ratio of attack were arranged in two series, which were shown by comparison to be closely correlated. The charting of a regression line with the figures thus obtained provides a helpful basis for the forecasting of outbreaks of the disease, inasmuch as the regressive co-efficient is the average change in production for each unit change in the ratio of attack. However, pending more extensive experiments under different seasonal and climatic conditions this curve is only of local application in the province of Mendoza, Argentina, where the trials were conducted [cf. *R.A.M.*, 24, p. 400].

Borzini (G.). **Esperienze di lotta antiperonosporica ed antioidica compiute nei vigneti di Maccarese nel 1948.** [Experiments on the control of mildew and *Oidium* carried out in Maccarese vineyards in 1948.]—*Circ. Centro Studi Anticritt. Pavia* 41, 8 pp., 1949. [Mimeographed.]

In further comparative spraying tests against vine mildew [*Plasmopara viticola*] carried out near Pavia in 1948 [*R.A.M.*, 28, p. 3], when the prevailing conditions strongly favoured infection, P.C. P./48 Caffaro (improved Caffaro powder containing 16 per cent. copper used at 1 per cent., and not neutralized), ordinary Caffaro powder (16 per cent. copper, used at 1 per cent.), and Rame [copper] Sandoz (containing about 50 per cent. copper, and used at 0·35 per cent., not neutralized) were about as effective as 1 per cent. Bordeaux mixture. Eleven treatments were given between 6th May and 27th July. From the seventh treatment on, the concentration of the ordinary Caffaro powder and Bordeaux mixture was increased to 1·5 per cent. and the average percentage of total leaf surface affected for 1 per cent. were 39 and 54, respectively, that for ramital Rumianca (12 per cent. copper) at corresponding strength 55 per cent., for 1 per cent. cupramina Rumianca (12 per cent. copper) 47·2, copper Sandoz 43·9, and improved Caffaro 39·7. To make cupramina and ramital really reliable their copper content should be increased.

In dust treatments against oidium [*Uncinula necator*: cf. ibid., 27 p. 310] by mid-August the percentages of fruit infection were as follows: activated (pigmented) sulphur 12, Z.C.B./47/1309 Caffaro 15, Z.P.C.P./48 Caffaro 16, volcanic sulphur plus Caffaro powder 20, and ordinary volcanic sulphur (control) 15 per cent. The

corresponding figures for wet treatments were: Rumianca copper sulphur (wettable activated sulphur plus a soluble cupric salt) 18, copper Sandoz+thiovit Sandoz 22, Bordeaux+Idrosolfo Cano 34, and activated sulphur+sandovit 42 per cent.

PIRIE (N. W.). **Development of ideas on the nature of viruses.**—*Brit. med. Bull.*, 5, 4–5, pp. 329–333, 1948.

After a brief historical survey the author discusses the nature of viruses under the following headings: (1) size as a criterion; (2) the physico-chemical approach; (3) microbes or molecules?; (4) nature of the fundamental virus-particles; (5) combination of virus with tissue constituents; and (6) conclusions. A list of references comprising 44 titles is appended.

JOHNSON (J.). **System of virus classification and nomenclature.**—*Tijdschr. PlZiekt.*, 55, 3, pp. 128–137, 1949. [Dutch summary.]

The advantages and disadvantages of the different systems of virus classification and nomenclature in current use are discussed in the light of 50 important contributions to the subject. The final decision on the choice of a system to be generally followed rests with the next International Botanical Congress, planned for 1950. The author recommends the designation of the virus after the host (common or Latin name, or both), followed by the word 'virus' and a number (supplemented by a letter in the case of more than one strain). This mode of nomenclature would be purely technical and in no way concerned with the genetic aspects of the virus.

BAWDEN (F. C.). **Department of plant pathology.**—*Rep. Rothamst. exp. Sta., Harpenden, 1947*, pp. 49–52, 1948.

The author reviews the work on virus diseases carried out at Rothamsted in 1947, when particular attention was paid to conditions that affect the extraction of potato virus X from plants and cause it to aggregate and inactivate [*R.A.M.*, 27, pp. 491, 536]. The effects of fertilizers and environmental conditions on the susceptibility of plants to virus infection were studied in the glasshouse. Phosphorus was found much more important than nitrogen or potassium in increasing susceptibility of [tobacco] plants to infection with tobacco mosaic virus and in increasing virus multiplication, but it was also the most effective nutrient in increasing plant size. Assessing susceptibility by numbers of lesions per leaf, phosphorus increased susceptibility about five times, but assessing it by lesions per unit area, it increased susceptibility by less than 50 per cent. Phosphorus doubled the concentration of virus in sap and increased the total virus content of plants ten times. In the presence of phosphorus, nitrogen increased the virus concentration and the total virus content of infected plants. Virus isolated from the variously treated plants did not differ in infectivity. In a survey of a limited area in Lincolnshire, infection of sugar beet by virus yellows [ibid., 27, p. 169] varied in individual crops from 5 to 100 per cent. Rate of infection was increased by late sowing and thin stands.

Agar plates of *Helicobasidium purpureum* [ibid., 26, pp. 124, 475] incubated for two months at 25° C. were then buried in soil for three to four months and the longevity tested by inoculating carrot seedlings. Survival was prolonged by raising the carbohydrate concentration of the medium, but curtailed by excess of nitrogen. The optimum nitrogen requirement for survival increased with rise in carbohydrate content of the medium. Survival was correlated with production of firm, resilient sclerotia round the centre of the colony. The depressing effect of excess nitrogen upon sclerotial production and survival is attributed to increased density of mycelial growth, which reduced the carbohydrate level below the requirement for maturation of viable sclerotia.

In conditions favouring infection the resting sporangia of *Plasmodiophora brassicae* evidently germinate spontaneously in fallow soil, the spore population being reduced by about 90 per cent. during the first few weeks after a spore suspension has been added to the soil. The reduction is less rapid in dry or alkaline soils than in wet or acid ones.

There was less [wheat] eyespot (*Cercosporella herpotrichoides*) [ibid., 27, p. 278] at Rothamsted in 1947 than at any time since research began in 1937, the late spring and dry summer both limiting infection. In 1946, eyespot was prevalent (in field experiments) on Little Knott. Sulphuric acid spraying reduced eyespot and lodging and increased yields by 1·8 cwt. per acre. Increasing the seed rate from $1\frac{1}{2}$ to $3\frac{1}{2}$ bush. per acre and the rate of ammonium sulphate application from 0 to 4 cwt. per acre increased lodging but had little effect on yield.

McKay (R.). **Some observations on plant diseases in Ireland in 1947.**—*J. Dep. Agric. Éire*, 45, pp. 45–50, 1948. [Received August, 1949.]

Owing to the relatively dry weather in the springs of 1944, 1945, and 1946, wheat in County Dublin was seriously affected by powdery mildew (*Erysiphe graminis*) [*R.A.M.*, 24, p. 177] and yellow rust (*Puccinia glumarum*) [ibid., 23, p. 173], whereas the corresponding rather wet period in 1947 was responsible for a negligible incidence of the former, and very slight attacks of the latter disease. In the wetter areas of the country yellow rust is rare or absent. Viable uredospores of *P. glumarum* were collected from volunteer plants throughout the severe winter of 1946–7, but the disease was not detected on the wheat crop until May. Ear blight (*Gibberella zeae*) [ibid., 26, p. 191] was prevalent on wheat in Co. Dublin at the end of July and, although usually only single spikelets on the ear were attacked, up to 10 per cent. of the heads were affected. The very warm weather in August stopped the further development of the disease, but in some cases the central rachis was already invaded, resulting in rather low grain yields. Perithecia of the fungus, found during previous years, were not recorded in 1947.

Flax rust (*Melampsora lini*) [ibid., 27, p. 235] was widespread but slight during the year under review, the most severely diseased crop being in a field repeatedly used for stacking flax and for spreading retted flax. Here *Phoma* foot rot was exceptionally severe also. Other flax diseases met with during a tour of inspection were grey mould (*Botrytis cinerea*), stem break (*Polyspora lini*), *Rhizoctonia* sp., and stalk disease (*Sclerotinia sclerotiorum*) [loc. cit.].

Under Eire conditions *Phoma betae* [ibid., 27, p. 550] is the predominant organism associated with black leg of sugar beet seedlings, occurring in 93 per cent. of 114 samples tested. The fungicidal dressing, applied to all sugar beet seed before distribution to farmers, appears to be ineffective against this pathogen.

Bacterial canker of tomato (*Corynebacterium michiganense*) [ibid., 27, pp. 393, 592] reported for the first time in the country, occurred in the Dublin area on plants raised from imported seed, and in four other widely separated localities.

Flik (H. M.) & Saaltink (G. J.). **Ziekten en beschadigingen bij landbouwgewassen in 1948.** [Diseases and injuries of agricultural crops in 1948.]—*Maandbl. LandbVoorl.* 6, 3–4, pp. 96–107, 9 figs., 1949.

The following items occur among others in this report. During 1948 rye crops in Holland suffered extensive damage from brown rust [*Puccinia dispersa*]. *Septoria nodorum* occurred sporadically in low percentages (1 to 5) on wheat growing in various types of soil, not only in reclamation diseased areas as hitherto supposed.

Fusarium solani f. *pisi* was responsible for the early dying-off of pea crops in the south-west; the Urica, Mansholt G. E. K., Plukerwt, and Conservo varieties are very susceptible to this form of foot rot. A sudden wilting and dying-off of

lupins towards the close of the flowering period is believed to have been caused by *F. oxysporum*. Mosaic [virus] was prevalent in the same crop [ibid., 25, p. 68].

Blight (*Phytophthora*) [*infestans*] was already in evidence during May in some places. During July and August *P. infestans* and *Alternaria* [*solani*] both together caused heavy damage to potato leaves, an unusual manifestation.

The foliar discolorations associated with the so-called 'Noordeling phenomenon', which was widespread in 1948 on the Noordeling, Ijsselster, Record, Eigenheimer, and Bintje potato varieties, present close analogies with those of magnesium deficiency [*R.A.M.*, 25, pp. 98, 523], to which the condition is presumably attributable. Ijsselster reacts to the shortage with great rapidity, the leaves turning blackish-brown, shrivelling, and dropping or hanging limply, and this divergence in the symptoms was thought to point to a corresponding difference in etiology. Evidence is adduced, however, indicating that the two varieties respond in a different way to the same factor.

Yellows [virus] was widespread in 'steckling' beets as a result of the abundance of aphids in 1947 [cf. above p. 609]. Primary infection was also observed locally among sugar and fodder beets, the aphids responsible for its transmission having probably emanated from the heavily infested clamps. *Helicobasidium purpureum* was detected on beets during lifting in a number of low-lying plots; the fungus continued to develop in storage, causing extensive decay and very severe losses.

Deighton (F. C.). **Plant pathology.**—*Rep. Dep. Agric. S. Leone, 1947*, pp. 27–28, 1949.

The rice disease caused by *Ephelis pallida*, first observed at Rokupr agricultural station, Sierra Leone, in 1946, reappeared in the same area in 1947, but in a milder form. About 25 per cent. of the panicles of the susceptible Atebubu variety were infected, the fungus being first detected on 12th October and its pathogenicity culminating during the first half of December.

Severe outbreaks of black pod rot (*Phytophthora palmivora*) were reported on cacao from the Kokoru section of Gaura Chiefdom, where mealy pod (*Trachysphaera fructigena*) [*R.A.M.*, 17, p. 97] was also prevalent.

A Ceylon variety of cowpea was attacked in 1946 by *Uromyces vignae* in its aecidial stage. The rust is widespread in the Colony on the wild *Vigna venulosa*, but it had not previously been observed on cowpea, the local varieties of which are still free from infection.

Pseudoperonospora cubensis, not hitherto recorded from Sierra Leone, was common on the leaves of the Cool and Crisp cucumber variety grown at Njola from South African seed.

Buchanan (R. E.), St. John-Brooks (R.), & Breed (R. S.). **International bacteriological code of nomenclature.**—*J. gen. Microbiol.*, 3, 3, pp. 444–462, 1949.

This paper has already been noticed from another source [*R.A.M.*, 28, p. 323. It also appears in *J. Bact.*, 55, p. 287, 1948].

Bartholomew (J. W.). **Flagellation of certain species of Pseudomonas as seen with the electron microscope.**—*J. gen. Microbiol.*, 3, 3, pp. 340–346, 3 pl., 1949.

Studies made in the Department of Bacteriology, University of Southern California, Los Angeles, showed the number and distribution of flagella on six species of *Pseudomonas* [*R.A.M.*, 28, p. 513] to vary considerably for different cells of a culture. The flagellation reported for certain species of the genus in the sixth edition of Bergey [loc. cit.] appears to be in error. The author found that a flagellum

on a *Pseudomonas* cell may originate laterally or terminally. In some electron micrographs the flagellum was apparently attached to the cytoplasm of the cell. The diameter varied greatly and some flagella tended to stick together in bundles. The terms monotrichate, lophotrichate, and amphitrichate are considered of little use in identification. Bacteria should be classified as non-motile or motile and either possessing peritrichate flagella or with a tendency for terminal flagellation.

Bhide (V. P.). **A comparative study of some wilt-producing phytopathogenic bacteria.**—*Indian Phytopathology*, 1, 1, pp. 70–91, 1948.

A comparative study was made of 32 isolates of nine species of bacterial plant pathogens, all vascular parasites causing wilting, from the standpoint of cultural characters and host relations [*R.A.M.*, 28, p. 512].

All the species were rod-shaped, non-sporulating, and non-acid-fast. The four species of *Corynebacterium* were Gram-positive and the other bacteria Gram-negative. Three species of *Corynebacterium* (excepting *C. flaccumfaciens*) were non-motile and also *Bacterium* [*Xanthomonas*] *stewarti*, while the other species were motile. The temperature range for *X. campestris* and *C. flaccumfaciens* was 15° to 40° C., but the limits for optimum growth in the other *Cornyebacterium* species were narrower. *C. flaccumfaciens* and *C. michiganense* induced moderate liquefaction of gelatin but no hydrolysis of starch, while *C. sepedonicum* attacked starch moderately but not gelatin. *C. insidiosum* did not liquefy gelatin or hydrolyze starch. Tested by the lead acetate strip method, all the bacteria except *X. solanacearum* produced hydrogen sulphide, a property demonstrated for the first time in the case of *C. flaccumfaciens*, *C. michiganense*, *C. insidiosum*, and *X. stewarti*. An alkaline reaction was produced in milk by *X. solanacearum*. Only *X. stewarti* and *X. solanacearum* could utilize asparagine as the sole source of carbon and nitrogen, while the *Corynebacterium* spp. and *Erwinia tracheiphila* made no growth on a synthetic inorganic nitrogen medium with carbon compounds as the source of energy. On a basal peptone medium *X. campestris* and *X. lespedezae* produced alkaline substances from all the carbon compounds tested, utilizing a large number of the compounds including citric and acetic acids, whereas *X. solanacearum* induced alkaline reaction but assimilated only a few; *X. stewarti* produced acid from all the test substances and utilized the acid so produced. The *Corynebacterium* spp. were much less active than the others in their utilization of amino acids as sources of nitrogen or carbon or both. Glutamic acid supplied all the species with nitrogen in the presence of dextrose as a source of carbon.

Wounds are a necessary preliminary to host invasion, though natural apertures are occasionally utilized as well, e.g., hydathodes and stomata by *X. campestris*, only the former by *X. stewarti*, and only the latter by *X. lespedezae* and *C. michiganense*, while *C. sepedonicum* can enter potato plants through the root tips. The xylem is the principal site of invasion by most of the organisms, but *C. michiganense* penetrates the phloem of tomato plants. It did not attack potatoes in these experiments, nor was *Matthiola incana* susceptible to the strains of *X. campestris* used. In cross-inoculation tests involving the common hosts of all the wilt bacteria except *X. solanacearum*, only *C. sepedonicum* attacked another host (tomato) besides its own. A host range list for each species is given.

On the basis of these studies the wilt bacteria appear to fall into two groups in respect of their enzymatic activities, nitrogen utilization, and growth-temperature range. Group (1) comprises *X. campestris*, *X. lespedezae*, *X. solanacearum*, and *X. stewarti*, and group (2) *C. flaccumfaciens*, *C. michiganense*, *C. sepedonicum*, and *C. insidiosum*. The growth reaction of members of the second group is largely specific in respect of their utilization of the amino acids, suggesting that the development of these organisms in the host is dependent on particular nutrilites elaborated by the interaction of host and parasite.

Patel (M. K.). **Xanthomonas uppalii sp. nov. pathogenic on Ipomoea muricata.**—*Indian Phytopathology*, 1, 1, pp. 67–69, 1948.

A description is given of the morphology, cultural characters, biochemical reactions, and pathogenicity of *Xanthomonas uppalii* n.sp., the agent of a leaf spot and wilt of the creeper, *Ipomoea muricata*, near Poona. The symptoms of the disease closely simulated those of *X. phaseoli* on French bean (*Phaseolus vulgaris*) and of *X. vignicola* [*R.A.M.*, 23, p. 468] on cowpea, but the new species differs from both these organisms in both cultural reactions and parasitism being pathogenic only to its own host and other *Ipomoea* spp.

Caffrey (M.). **Breeding for disease resistance.**—*J. Dep. Agric. Éire*, 45, pp. 38–44, 1948. [Received August, 1949.]

A brief account is given of various investigations which have led to the control of certain diseases of cereals and fodder and root crops by the breeding of resistant varieties and strains.

Goulden (C. H.) & Stevenson (T. M.). **Breeding for disease-resistance in Canada. Part I. Cereals.**—*Emp. J. exp. Agric.*, 17, 67, pp. 133–140, 1949.

This comprehensive review, to which a number of workers at the breeding centres of the Dominion Experimental Farms System have contributed, traces the progress in breeding varieties of wheat, oats, and barley resistant to the more prevalent diseases in Canada during recent years. A list is given of licensed spring wheat varieties resistant to stem [black] rust (*Puccinia graminis tritici*). In a search for varieties resistant to leaf [brown] rust (*P. triticina*) it was found that Exchange (or Warden × Hybrid English) is resistant to all the races of the rust distributed throughout the prairie provinces.

Ledingham (R. J.), Sallans (B. J.), & Simmonds (P. M.). **The significance of the bacterial flora on Wheat seed in inoculation studies with Helminthosporium sativum.**—*Sci. Agric.*, 29, 6, pp. 253–262, 1949.

Some of the results of these studies carried out at the Dominion Laboratory, Saskatoon, have already been noticed [*R.A.M.*, 28, p. 452].

The surface flora of wheat seed may be increased greatly by moistening the seed with water and incubating it for 16 hours or more. Seedlings from such seed showed more resistance to *Helminthosporium sativum* [loc. cit.] in inoculation tests, particularly in Petri dishes or in sterile soil, than those from untreated seed. In a greenhouse inoculation test with *H. sativum* bacterization of the seed with organisms from wheat seed reduced disease in seedlings grown for ten days in unsterilized soil. Good results were also obtained after bacterization in both sterilized and unsterilized soil in the laboratory.

Pugsley (A. T.). **Back-crossing for resistance to stem rust of Wheat in South Australia.**—*Emp. J. exp. Agric.*, 17, 67, pp. 193–198, 1 pl., 1949.

In breeding experiments at the Waite Agricultural Research Institute, South Australia, the stem [black] rust (*Puccinia graminis tritici*) resistance of Gabo [*R.A.M.*, 28, p. 450] has been transferred by back-crossing to ten South Australian wheat varieties, of which Bencubbin 48, Dirk 48, Dundee 48, Javelin 48, Rapier 48, Ridley 48, Scimitar 48, and Seewari 48 have been released to farmers. The rust epidemics of 1946 and 1947 demonstrated the superiority of these new strains.

By adding a second or third resistant gene to a variety through back-crossing (which under South Australian conditions takes no longer than three years, as four back-crosses appear to be sufficient), any change in the composition of the physiologic races in an area may be countered, but the breeder must possess a

knowledge of the available 'resistant' genes and their relationship to the known races of the pathogen concerned [cf. ibid., 28, p. 567]. In case of *P. g. tritici* an important gap exists in this knowledge, which makes effective breeding for resistance to the disease very difficult. The physiologic races of *P. g. tritici* continue to be classified on the basis of a rather arbitrarily chosen list of differential varieties, and the substitution of these varieties by others possessing known single genes would be of great help to the plant breeder.

Borlaug (N. E.), Rupert (J. A.), & Harrar (J. G.). **Nuevos Trigos para México.** [New Wheats for Mexico.]—*Foll. Divulg. Secret. Agric. Méx.* 5, 29 pp., 14 figs., 1949. [English summary.]

From the introduction and re-selection phase of the wheat-breeding programme initiated in 1944 by the Rockefeller Foundation in co-operation with the Mexican Government four varieties have been developed, namely, (1) Rocamex 211 'Supremo' = Surpresa × (Hope × Mediterranean); (2) Rocamex 209 'Frontera' = Fronteira × (Hope × Mediterranean); (3) Rocamex 324 'Kenja Rojo' = selection made from seed from Kenya; and (4) Rocamex 321 'Kenya Blancs' = selection from seed from Kenya. All four varieties give prolific yields in the areas recommended for their cultivation and are highly resistant to the common races of stem [black] rust (*Puccinia graminis tritici*) present in Mexico, where periodical epiphytotics of the disease are responsible for heavy losses [*R.A.M.*, 17, p. 381; 27, p. 278; 28, p. 329]. For instance, in 1947–8 the rust destroyed between 30 and 40 per cent. of the crop in Bajío and Mesa Central areas, the largest wheat-growing regions in the country, while in 1948–9 heavy damage was caused by the disease in the Mayo valley on the west coast and in the north of the State of Coahuila.

Seed of the four new varieties is now available in large quantities and four other new hybrids are also being increased for the second time. They are much earlier than the four above-mentioned and better adapted to mechanical harvesting.

Stripe [yellow] rust (*P. glumarum*) also causes considerable damage in some seasons to wheat growing at high altitudes. Leaf [brown] rust (*P. triticina*) is widespread but of less importance than the other two species.

Peturson (B.). **Epidemiology of rust in western Canada as influenced by the introduction of stem-rust resistant varieties.**—*Sci. Agric.*, 29, 5, pp. 230–236, 1949.

Spore-trap slides exposed at three stations in Manitoba from 1926 to 1946 showed that following the general introduction into western Canada in 1939 of wheat and oat varieties resistant to stem [black] rust (*Puccinia graminis tritici* [*R.A.M.*, 28, pp. 567, 568] and *P. g. avenae*, respectively) there was a significant reduction in the numbers of air-borne black rust uredospores especially towards the end of each season but no reduction in leaf [brown] rust (*P. triticina*) spores.

Comparison of black rust readings in uniform rust nurseries at several locations in western Canada for the susceptible varieties Marquis and Little Club from 1925 to 1929 with those from 1942 to 1946 shows that black rust infection on these varieties was much heavier during the earlier period, when susceptible varieties predominated. Furthermore, the more northward and westward the location of the area, the greater was the difference between the highest rust readings for the two periods. This indicates that the spread northward and westward of black rust was appreciably less during the latter period.

Since 1925 the introduction of varieties resistant to black rust has had no effect on the physiologic-race complex in western Canada, although a new race, 15B [ibid., 27, p. 553; 28, p. 328], appeared. Several new races of *P. triticina*, such as 128, and certain biotypes of races 5 and 15 [ibid., 27, pp. 120, 553] have appeared and increased, as they are able to attack Regent and Renown, previously resistant.

Before Vanguard (released in 1937) and Ajax and Exeter (released in 1943) became the predominant oat varieties in the rust area, the common races of black rust [ibid., 26, p. 385], 1, 2, and 5, to which these varieties are highly resistant, comprised over 90 per cent. of the races collected in western Canada. In 1943, races 8, 10, and 11 increased notably and each year since this increase has continued; in 1945 and 1946 these three races comprised 33 per cent. of the oat black rust isolates obtained from western Canada. No change has occurred in recent years in the relative prevalence of the races of oat crown rust [*P. coronata*: cf. loc. cit.].

From 1934 to 1938, the yield of Regent wheat in experimental plots at four stations in the rust area exceeded that of the susceptible variety Marquis by 12·1 bush. per acre. From 1939 to 1946, after the general introduction of resistant varieties, however, the figure fell to 7·2. This improvement in Marquis was probably due to the reduction of rust inoculum in the area. However, the continued inferior yields of Marquis since resistant varieties have predominated in the rust area indicates that the extensive use of resistant wheat affords only partial protection to susceptible varieties.

Although the introduction of rust-resistant wheat varieties caused a notable reduction in the numbers of air-borne black rust spores, there still remains an important reservoir of inoculum in the extensive areas occupied by *Avena fatua*, *Hordeum jubatum*, *Agropyron* spp., and other susceptible grasses, as well as susceptible varieties of barley and certain oat varieties resistant to some races only of black rust.

Since the introduction of rust-resistant varieties in western Canada there has been a considerable diminution in the numbers of black rust uredospores in southern Manitoba in early June, probably because fewer spores are produced in the adjacent spring wheat area of the United States, where the crop also consists mainly of resistant varieties. In the south-western United States and northern Mexico, where black rust overwinters, susceptible varieties are still grown. From this area the rust spreads north in spring into the winter wheat belt of Kansas, where susceptible varieties predominate. By late June the wave of black rust infection has spread farther north into the spring wheat area of the United States and Canada. It is evident, therefore, that the amount of inoculum present in southern Manitoba in early June each year, as well as the physiologic races represented in it, are determined by the host plants present where black rust overwinters, and in which it develops as it spreads northwards.

The reduced prevalence of the common physiologic races due to the introduction of resistant varieties affords, by reduced competition, a greater opportunity for the development and spread of virulent physiologic races which already exist or may be produced. That this occurs is indicated by (1) the appearance and increased prevalence of races such as race 128 of wheat brown rust following the introduction of Renown, Regent, and other wheats possessing resistance to many other races of the rust; (2) the increased prevalence of races 8, 10, and 11 of oat black rust following the introduction of resistant varieties; and (3) the appearance in Canada in 1946 of race 15B of wheat black rust, first reported in the United States in 1942.

Mastenbroek (C.). **Een albino in stuifbrand van Gerst.** [An albino in Barley loose smut.]—*Tijdschr. PlZiekt.*, 55, 3, pp. 210–212, 1 fig., 1949. [English summary.]

In the course of breeding experiments in 1946 at Hoofddorp, Holland, on the development of resistance to loose smut (*Ustilago nuda*) in barley [*R.A.M.*, 22, p. 246], a white infected ear was detected in the highly susceptible spring variety Abed Kenia [cf. ibid., 14, p. 353]. Inoculation of ten ears of the same variety with the albino form resulted in six white ears in 1947, when the process was repeated, giving rise to 20 albino ears in 1948. The low rate of multiplication may point either to a low grade of virulence or poor germinability. The white form is believed

to have arisen through mutation. So far no reversion to the normal black spore coloration has been observed.

JONES (E. T.). **The breeding of disease-resistant varieties of Oats. Part I. Physiologic races, diseases, and pests.**—*Emp. J. exp. Agric.*, 17, 67, pp. 199–204, 1949.

After a brief note on the genetic stability of the pathogenicity of the physiologic races of pathogenic fungi, the author lists the principal oat diseases which occur in Britain and summarizes the current knowledge of the physiologic races of the pathogens concerned with reference to the literature (67 titles).

LEFEBVRE (C. L.), JOHNSON (A. G.), & SHERWIN (HELEN S.). **An undescribed species of Periconia.**—*Mycologia*, 41, 4, pp. 416–419, 1 fig., 1949.

Portions of the diseased roots of a Colby milo [sorghum] plant collected in Kansas in 1947 and showing characteristic symptoms of milo disease caused by *Periconia circinata* [*R.A.M.*, 28, pp. 170, 331] were kept in a moist chamber for observation. After a few days *P. circinata* was evident at a number of points together with another, unidentified species of *Periconia*. In pathogenicity tests *P. circinata* attacked susceptible but not resistant sorghum planted in inoculated soil. The other species, however, was non-pathogenic to both. Since it differed both morphologically and pathogenically from *P. circinata* and other recognized *P.* species, the organism is designated as *P. macrospinosa* n.sp.

DE CARVALHO (T.). **O mildio de Milho (Sclerospora sp.).** [Mildew of Millet (*Sclerospora* sp.).]—*Gaz. Agric., Moçambique*, 1, 3, pp. 61–63, 3 figs., 1949.

In 1947 millet [unspecified] was observed to be infected by *Sclerospora* (?) *graminicola* [*R.A.M.*, 24, p. 312] at the Umbelúzi Experiment Station, Mozambique, this being the first record of the downy mildew in the Colony. During the current season further outbreaks occurred in the same locality and in two other areas, this time in a more severe form, resulting in one plantation in a reduction of over 60 per cent. of the crop. The symptoms of the disease are briefly described and its geographical distribution indicated. The importation of seed millet into Mozambique is subject to a guarantee of freedom from infection by *S.* spp. Control measures should include early sowing; several years' crop rotation, omitting any kind of sorghum; seed disinfection with a mercurial fungicide, such as agrosan GN, ceresan, or abavit B; and use of resistant varieties.

HOPKINS (E. F.) & LOUCKS (K. W.). **A curing procedure for the reduction of mould decay in Citrus fruits.**—*Bull. Fla agric. Exp. Sta.* 450, 26 pp., 1948. [Received November, 1949.]

It was found that holding oranges in a colouring room at 86° F. (30° C.) and 90 per cent. relative humidity, with continuous ventilation (with or without ethylene), brought about a marked curing effect which greatly reduced the susceptibility of the fruit to decay by *Penicillium* moulds [*P. italicum* and *P. digitatum*: *R.A.M.*, 28, p. 285]. Possible reasons for this reduction in mould infection during the curing process are (*a*) changes in the peel tissue, especially at wounded surfaces, which render it more resistant, (*b*) the high temperature which may reduce the pathogenicity of the fungi, and (*c*) peel oil (responsible for breakdown of the rind tissue) may be volatilized at the high temperature and carried off by the air-flow. Since both mould infections and chemical peel burn are prevented by curing, there may be a fundamental relation between them. These results confirmed commercial experience. For example, at the beginning of the season, when green fruit requires 60 to 72 hours in the colouring rooms, the amount of stem rot (*Diplodia natalensis*) [ibid., 24, p. 542] is high, owing to the action of ethylene, but the percentage of *Penicillium* moulds is low. When de-greening is no longer

necessary *Penicillium* infections increase sharply and reach a maximum during the latter half of February, falling thereafter to a low value as the weather becomes warm and humid. In samples of fruit from commercial packing houses there was about four times as much mould in fruit which had not been subjected to colouring room treatment. Curing at the end of the ethylene de-greening season should therefore greatly reduce the amount of decay caused by *Penicillium* (blue and green) moulds.

GOIDÀNICH (G.) & RUGGIERI (G.). **Effetti del freddo e 'mal secco' negli Agrumeti siciliani.** [The effects of cold and 'mal secco' in Sicilian Citrus groves.]—*Ann. Sper. agr.*, N.S., 3, 2, pp. 391–397, 6 figs., 1949. [English summary.]

Observations on 'mal secco' disease in Sicilian citrus groves [*R.A.M.*, 28, p. 214] and anatomical studies have shown that although low temperatures can be a predisposing factor in the development of *Deuterophoma tracheiphila* in the tissues, the presence of frost lesions merely facilitates the penetration of the mycelium and is not necessary for the establishment of the parasite. These findings appear to settle the controversy between Petri and Gassner [ibid., 25, p. 444].

SCURTI (J.). **Sulla oleocellosi delle Arance e sulle modificazioni istologiche che la caratterizzano.** [Oleocellosis of Oranges and the histological changes by which it is characterized.]—*Ann. Sper. agr.*, N.S., 3, 1, pp. 179–193, 2 col. pl., 6 figs., 1949. [English summary.]

Microscopical observations by normal and polarized light showed clearly that the ochraceous spots typical of the condition known as oleocellosis [*R.A.M.*, 19, p. 86] formed on oranges during refrigeration are caused by unequal temperatures in an insufficiently ventilated space. Excessive quantities of oil are produced and, instead of volatilizing, they corrode the cuticle of the epicarp disorganizing its structure by dissolving the wax. Corrosion is followed by dehydration which results in depression, contraction, and degeneration of the cytoplasm. The brown discoloration is due to enzymatic oxidation. An acid degeneration occurs, especially in the areas most severely affected.

CHEVALIER (A.). **Sur un Citrus d'apparence spontanée vivant dans la forêt dense de l'Ouest africain.** [On an apparently wild Citrus living in the dense forest of West Africa.]—*Rev. Bot. appl.*, 29, 321–322, pp. 355–366, 3 pl., 1949.

In the forests of the Ivory Coast the author observed between 1905 and 1910 and again in 1948, citrus trees 8 to 10 ft. high, yielding juicy, acid fruits of the size of a large orange. The local names for this tree are 'forest orange' or 'wild orange'. The author refers it (with a full technical description) to *Citrus aurantium* s.sp. *africana* (syn. *C. maxima* var. *africana*). It appears to be unaffected by diseases. When growing in a damp undergrowth, the leaves are often partly covered on the upper surface with algae and fungi, and the trees seldom fruit, but as soon as the surrounding forest is cut down and the trees are exposed to the light they crop heavily. Round each tree robust seedlings grow up, and after four or five years bear fruit. These trees never show gummosis and have never been affected by any virus. For some time past the tree has been used in French Guinea as a stock for orange, mandarin, and grapefruit. It would appear to be an ideal stock for cultivated citrus.

LINDGREN (D. L.), BLISS (D. E.), & BARNES (D. F.). **Insect infestation and fungus spoilage of Dates—their relation and control.**—*Rep. Date Grs' Inst., 1948*, pp. 12–17, [? 1948].

During 1947 fungicidal and insecticidal experiments were made on test plots of

dates in the Coachella Valley, California. They included dusting with thiomate '19' [cf. *R.A.M.*, 27, p. 430] and other fungicides, and with insecticides used singly or in combination with the fungicides, on Deglect Noor plots near Indio and Coachella, Khadrawy plots near Indio and Mecca, a Medjhool plot near Indio, and a Saidy plot at Palm Village.

Where fungus [unspecified] spoilage was decreased significantly by the use of fungicides, the number of fruits infested with beetles (*Carpophilus hemipterus*, *C. dimidiatus*, *Urophorus humeralis*, and *Haptoncus luteolus*) was also reduced. A positive correlation was found to exist between the degree of fungus spoilage and that of insect infestation.

At Indio fungus spoilage was controlled most effectively by inserting wire rings between the fruit-strands and dusting the dates with thiomate '19'. In the other experimental plots thiomate '19' proved more satisfactory than either zerlate in sulphur or yellow cuprocide in sulphur. In general, more fungus and insect spoilage occurred on the north or north-west side of a palm than on the south side.

Drechsler (C.). **A nematode-capturing fungus with anastomosing clamp-bearing hyphae.**—*Mycologia*, 41, 4, pp. 369–387, 4 figs., 1949.

A full description is given of *Nematoctonus concurrens* n.sp. [cf. *R.A.M.*, 22, p. 386], which captures and consumes the nematodes *Panagrolaimus subelongatus* and *Ditylenchus* sp., and occurs in decaying stems and leaves of *Bromus secalinus* near Hermiston, Oregon.

Prasada (R.). **Studies in Linseed rust, Melampsora lini (Pers.)Lév. in India.**—*Indian Phytopathology*, 1, 1, pp. 1–18, 1948.

Flax rust (*Melampsora lini*) is a limiting factor in linseed production in India [*R.A.M.*, 3, p. 78; 13, p. 683; 19, p. 655], where the crop covers 5,000,000 acres. The author's studies were undertaken to elucidate the life-history of the fungus and the problem of its oversummering in different parts of the country.

Cultures of the rust were maintained continuously in the uredo stage both in the greenhouse and in miniature plots at Simla (7,200 ft. above sea-level) for six years, whereas at Agra, in the plains, the pathogen survived only from November to April, and all attempts to re-establish it during the hot weather (May to October) by means of fresh uredospores from the hills were unsuccessful. The uredospores germinate freely between 3° and 30° C., with an optimum near 15° to 16°; 24 hours' exposure of fresh spores to a temperature of 38° to 43° or 9 hours at 43° to 50° resulted in total loss of viability. In comparative experiments to determine the longevity of the uredospores at various temperatures, viability decreased successively and ceased after 18 to 20 weeks at 5° to 7°, 11 to 14 weeks at 0°, and 14 to 16 weeks at 10° to 15°. Temperatures between 13° and 21° appear to be the most conducive to host infection and rust development, the symptoms appearing after a minimum incubation period of seven days. The uredospores germinate in water in 80 minutes and infection takes place on plants three hours after inoculation. In the plains the teleutospores are viable at the time of their production on the crop in March but succumb to the high temperatures prevailing after harvest, complete loss of viability following 36 hours' exposure at 43° to 50°. On the other hand, the teleutospores can germinate soon after production in the hills, where they retain their viability throughout the summer and, under dry conditions, up to the time of the next crop. The temperature range for teleutospore germination is from 7° to 24°, with an optimum near 16° to 18°.

The aecidial stage has not been found occurring naturally on the crop, but greenhouse inoculations between 10° and 27° resulted in the formation of pycnia and aecidia within 8 to 9 and 15 days, respectively. The aecidiospores germinate freely in tap water within an hour at the optimum temperature of 16° to 18°, the

minimum and maximum being 5° and 27°, respectively. Six hours' exposure at 43° to 50° destroyed all the aecidiospores, and their viability was rapidly lost in storage at — 5° and 0°; at 7° to 10°, 10 to 20 per cent. were still germinable after four weeks; and at 10° to 15°, 10 per cent. after three weeks. Five physiologic races of *M. lini* [ibid., 26, p. 489], designated Simla 1 to 5, could be identified by means of the reactions of 50 linseed and flax varieties to seven rust collections obtained from the Punjab, United Provinces, and Bihar and Central Provinces. A key is given for the identification of the five races and is based on the differential varieties Tall, Fx 8, R.R. 280, and R.R. 135.

Butler (F. C.). **Pasmo disease of Linseed.**—*Agric. Gaz. N.S.W.*, 60, 6, pp. 291–293, 1 fig., 1949.

For the control of pasmo disease (*Sphaerella linorum*) on linseed flax in New South Wales [*R.A.M.*, 28, p. 288] it is recommended that only disease-free seed should be used, with routine dusting with an organic mercury compound. Infected stubble should be burned and the residue ploughed in immediately after harvest. Wild flax and volunteer plants should also be destroyed and crop rotation introduced.

Diehl (W. W.). **Cladosporium heugelinianum on Buddleia.**—*Plant Dis. Reptr*, 33, 6, p. 274, 1949. [Mimeographed.]

In March, 1949, the lower surfaces of leaves of *Buddleia asiatica*, growing in a greenhouse in Clarke County, Virginia, exhibited numerous sooty spots (approximately 2 mm. in diameter) caused by *Cladosporium heugelinianum*. This is believed to be the second record of the fungus in America, the other being represented by a specimen from *Buddleia* sp. in the Mycological Collections of the Plant Industry Station, Beltsville, Maryland, collected in 1926.

Chevalier (A.). **Sur une virose remarquable ayant fait apparaître une espèce linnéenne nouvelle par mutation de la Cymbalaire des murailles.** [On a remarkable virosis which caused the appearance of a new Linnean species by mutation from *Cymbalaria muralis*.]—*C. R. Acad. Sci., Paris*, 228, 13, pp. 1077–1079, 1949.

In 1936 the author designated as *Cymbalaria toutoni* a plant differing from the widespread *C. muralis* in having deeply lobate and basally cuneiform leaves instead of the normal reniform-cordate, while the flowers and capsules also presented special characteristics. Propagation was effected by means of seeds and cuttings and the supposed mutant is now largely cultivated in France. In 1946–7 outdoor plants of *C. toutoni* in Paris were killed by frost, but specimens from the Alpine garden of the Paris museum were transferred to the laboratory for closer study. All kinds of anomalies were observed, including more or less crumpled and asymmetrical leaves, sometimes folded over like a hem, while others were cupuliform with small, filiform appendages on the upper surface. The recent perusal of H.H.P. Severin's study on spinach viruses in California [*R.A.M.*, 28, p. 265] revealed comparable laciniations of the foliar system, as well as floral abnormalities, and it now appears that *C. toutoni* may likewise be the result of a virosis.

Staten (G.) & Leyendecker (P. J.). **A root rot disease of Alfalfa caused by Fusarium solani.**—*Plant Dis. Reptr*, 33, 6, pp. 254–255, 3 figs., 1949. [Mimeographed.]

In 1945 at the New Mexico Agricultural Experiment Station farms the root systems of a considerable number of lucerne plants bore external lesions with reddish-brown vascular discoloration, originating in most cases from lateral roots. Many

infections remained localized in the crown area causing a typical crown rot. Numerous isolations yielded *Fusarium solani* [*R.A.M.*, 28, p. 18], identified by Dr. W. C. Snyder, University of California. The pathogenicity of the fungus was determined by soil and crown inoculations of seedlings and young plants; 21 per cent. of the former damped off, the pathogen being readily re-isolated from the seedlings, and 40 to 80 per cent. of the latter showed symptoms identical to those exhibited in the field. The leaves were pale green to yellow and the plants were stunted. The pathogen appeared to be more virulent when entrance was afforded by natural or artificial wounding. The resistance of various lucerne varieties is being tested.

Sprague (R.) & Meiners (J. P.). **Some new disease records of Gramineae in the western United States.—III.**—*Plant Dis. Reptr*, 33, 6, pp. 259–270, 1949. [Mimeographed.]

This is a list of additions to the published host range record of leaf spots and rusts on Gramineae in the United States [cf. *R.A.M.*, 28, p. 345].

Riceman (D. S.). **Mineral deficiency in plants on the soils of the ninety-mile plain in South Australia. 5. Effect of growth and removal of a crop treated with zinc and copper upon pasture established subsequently on Laffer sand, near Keith. 6. Comparison of methods of establishment of mixed pasture sown with zinc and copper on Laffer sand, near Keith.**—*J. Coun. sci. industr. Res. Aust.*, 21, 4, pp. 229–235, 1 pl.; pp. 236–246, 6 pl., 1948. [Received August, 1949.]

In further experiments on virgin Laffer sand near Keith, South Australia [cf. *R.A.M.*, 28, p. 218], it was found that an initial cover crop could be grown without detriment to the mixed, permanent pasture crop sown subsequently. Under such conditions Bacchus Marsh subterranean clover [*Trifolium subterraneum*] was again the most successful legume. Further applications of zinc and copper are unnecessary where 7 lb. zinc sulphate and 7 lb. copper sulphate have been previously applied to the inital cover crop or to unsown land. Provided that zinc and copper deficiency have been corrected, mixed pastures of Bacchus Marsh subterranean clover with *Phalaris tuberosa* and a small quantity of lucerne established on Laffer sand, though differing in composition and yield during the first three years according to the procedure of establishment, were eventually all of uniform growth.

Lafferty (H. A.). **Blind-seed disease of Rye-Grass.**—*J. Dep. Agric. Éire*, 45, pp. 192–201, 1948. [Received August, 1949.]

Examination of 109 seed crop samples of rye grass [*Lolium perenne*] from 24 counties in the main seed-growing areas in Eire, namely, Donegal, Cavan, Louth, and Monaghan and also in Kerry and Wexford, demonstrated that in 1947 and 1948 64·2 and 70 per cent., respectively, were infected with blind seed disease (*Phialea temulenta*) [*R.A.M.*, 23, p. 228]. A survey of seed-head samples from pastures and waste places showed that the disease was present in 21 of the southern counties. Samples of Danish and New Zealand perennial and Italian rye grass [*L. multiflorum*] seed were found to have 6 and 26 per cent. infection, respectively. It appears that the disease is one of long standing in Eire; examination of Dr. Pethybridge's rye grass seed collections made in 1910 revealed macroconidia of *P. temulenta* in every sample.

The results of germination tests confirmed earlier findings [ibid., 18, p. 186] that the germination rate of infected seed is very low, even under most favourable conditions. The control of the disease in the field is extremely difficult and the only hope of combating it in the future is by breeding resistant varieties [ibid., 27, p. 116].

KIMBALL (M. H.). **Oak root fungus may attack alternative crops.**—*Calif. Citrogr.*, 34, 9, p. 395, 1949.

Citrus growers of the San Gabriel Valley, California, who are contemplating planting deciduous fruit orchards where orange or lemon trees have been removed are reminded that most deciduous fruits may be destroyed by the oak root fungus [*Armillaria mellea*: cf. *R.A.M.*, 19, p. 245; 20, p. 183; 21, p. 396]. Persimmons and loquats, however, appear to be relatively immune, and avocados are highly resistant.

ROBERTS (E. A.), SOUTHWICK (M. D.), & PALMITER (D. H.). **A microchemical examination of McIntosh Apple leaves showing relationship of cell wall constituents to penetration of spray solutions.**—*Plant Physiol.*, 23, 4, pp. 557–559, 3 figs. (1 col.), 1949.

Spray solutions containing minor elements, nitrogen, hormones, and organic fungicides have been applied to apple foliage for the correction of nutritional deficiencies, prevention of fruit drop, or increase of resistance to disease. The positive results of such treatments demonstrated the penetration of the leaves and raised the question of the manner of its occurrence.

In this investigation a determination of the quantity and location of cutin, cellulose, and pectin-containing substances of the cell walls was made on sections of fresh McIntosh apple leaf material, using a freezing microtome, and staining with Sudan III for cutin and ruthenium red for pectins. The former was detected in lamellae parallel to the outer epidermal walls, but it by no means forms a continuous covering. The latter occur in abundance in intermittent parallel layers in the outer walls of the epidermal cells interspersed with cutinized areas. Layers of these substances also extend vertically and form a continuous path stretching from the outside of the leaf to the walls of the 'vein extensions', which contain a large amount of pectin substances, as also do the cell walls of the bundle sheath of a large vein.

It is clear from these findings that the cell walls of McIntosh apple leaves are not covered with a continuous cuticle preventing water absorption, as claimed by MacDaniels and Cowart (*Mem. Cornell agric. Exp. Sta.* 258). The amount and position of the pectin materials in the leaves explain the entrance of the above-mentioned water-soluble substances applied as sprays.

SMOCK (R. M.) & SOUTHWICK (F. W.). **Air purification in the Apple storage.**—*Bull. Cornell agric. Exp. Sta.* 843, 52 pp., 1948. [Abs. in *Food Sci. Abstr.* (formerly *Index Lit. Food Invest.*), 21, 5, pp. 306–307, 1949.]

During three seasons experiments were carried out with several apple varieties in a number of cold stores in which the air was purified by means of activated coco-nut shell carbon [*R.A.M.*, 27, p. 368]. After the first season auxiliary blowers were always used to ensure constant movement of air. Scald was consistently well controlled by this method when a single variety was stored but when several varieties were together in one room the results were inconsistent, particularly when Rhode Island Greening, which is particularly susceptible to scald, was included [cf. ibid., 25, p. 507]. The choice of variety and its state of maturity may largely determine the success of air purification in controlling this storage disorder. On the whole this method was as effective as the use of shredded, oiled paper in controlling scald when several varieties of apples were stored together, and added, on an average, about three weeks to the storage life of the fruit. The firmness of Wealthy, Cortland, or McIntosh could be maintained for a month or more longer by means of air purification. The construction of the air-purifying unit is described.

Cole (C. E.). **Pitting disorders in Pears.**—*J. Dep. Agric. Vict.*, 47, 7, pp. 317–320, 7 figs., 1949.

The most common type of pitting in pear fruits in Victoria is that due to stony pit virus [*R.A.M.*, 27, p. 555; 28, p. 462]; the varieties Josephine and Packham's Triumph [loc. cit.] are the most susceptible and Winter Nelis, Beurre Bosc, and Beurre d'Anjou have shown some infection. Buds or scions from affected trees should never be used for propagating or re-working. Doubtful cases of pitting should be referred to the district orchard supervisor and if identified as stony pit the affected trees should be removed. Working over to the W.B.C. (or Duchess) variety, which is recommended in America and New Zealand, is not considered safe under Victoria conditions as this variety has shown stony pit symptoms.

Lithiasis [ibid., 6, p. 672] (of unknown etiology) occurs occasionally in the dry Goulburn Valley on W.B.C. No recommendation for the control of this disorder can be given.

Grosjean (J.). **Omvang en verloop van de loodglansziekte bij een aantal Pruimenrassen in de Betuwe, gedurende de jaren 1941 tot en met 1946.** [Extent and course of the silver leaf disease in a number of Plum varieties in the Betuwe during the years 1941 to 1946, inclusive.]—*Tijdschr. PlZiekt.*, 55, 3, pp. 212–221, 2 graphs, 1949. [English summary.]

During the period covered by these observations the incidence of silver leaf [*Stereum purpureum*: *R.A.M.*, 25, p. 69] showed an increase in the plum varieties Victoria (from 17·6 to 35·8 per cent.), Early Laxton (11 to 30·5), Belle de Louvain (13·1 to 31·4), Early Orleans (4·6 to 11·3), and Early Rivers (3 to 6·6) and a decrease in Doyenné (from 9·6 to 6·9), Reine Claude d'Althann (16·9 to 8·8), and Jefferson (37·6 to 30·6), while in Reine Claude d'Oullens it remained at much the same level (21·4 and 18·8). In Czar a very sharp peak (26·7) was reached in 1943, followed by a decline. Bush and standard trees were attacked with equal severity.

The susceptibility of the several varieties was compared and expressed numerically, and calculations were made as to the likelihood of trees of different varieties contracting and recovering from the disease within five years. The probabilities of infection and for diseased trees to recover were computed as follows (in percentages): Early Rivers 4·3 and 20, respectively, Doyenné 5·9 and 50, Reine Claude d'Althann 8·9 and 70, Reine Claude d'Oullens 12·7 and 44·3, Early Orleans 12·9 and 22·2, Jefferson 20·5 and 42·2, Czar 22·6 and 30·4, Victoria 29·2 and 19·2, Early Laxton 30·1 and 17·6, and Belle de Louvain 31·5 and 10.

In conclusion the author points out the desirability of using Victoria or Early Laxton in place of Czar in experimental work.

Hahn (G. G.) & Miller (A.). **Rust immunity of Canadian Black Currants under field conditions in Connecticut.**—*Plant Dis. Reptr*, 33, 6, pp. 275–276, 1949. [Mimeographed.]

Further tests with Canadian black currant hybrid selections Nos. 0–381 and 0–393 (now known as Crusader and Coronet, respectively), immune from white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, 28, p. 21], were carried out under field conditions at Litchfield, Connecticut, in September, 1947. One potted plant of each variety and two rust-susceptible *Ribes cynosbati* plants were transplanted into a field in close proximity to cankered white pines (*Pinus strobus*). In May, 1948, the hybrids were dusted with aecidiospores of the pathogen. Throughout the experiment the Canadian hybrids remained completely free from infection, while the control plants and wild *Ribes* in the area were heavily rusted and practically defoliated by the end of the summer.

W. J. B[LACKIE]. **Fumigation damage to Pineapples.**—*Agric. J. Fiji*, 19, 2, pp. 45–46, 1948.

During November, 1947, two shipments of fresh pineapples from Fiji arrived in New Zealand in an unsatisfactory condition due to (1) the presence of *Thielaviopsis* [*Ceratostomella*] *paradoxa* [*R.A.M.*, 27, p. 572], and (2) fumigation damage, particularly in the Queen variety, caused either by impurities in the commercial carbon bisulphide used, or to some predisposing condition of the fruit.

TEMPLEMAN (W. G.). **Low volume sprayers for weed control.**—*J. Minist. Agric.*, 55, 10, pp. 441–443, 2 pl., 1949.

The author describes two types of prototype equipment for the application of low volume sprays (4 to 6 gals. per acre) against weeds and possibly other pests, (1) a standard Barclay, Ross, and Hutchinson farm sprayer converted for low volume work and (2) a Ferguson tractor adapted as a low volume sprayer by fitting a container, a gear pump driven from the power take off, and a 6 ft. boom and filter.

BLACKWELL (ELIZABETH). **Terminology in Phytophthora.**—*Mycol. Pap., Commonw. mycol. Inst.*, 30, 24 pp., 1 pl., 30 figs., 1949. 4*s.* 6*d.*

The following: mycelium, haustorium, branching and septation of hypha, types of hyphal swelling, chlamydospore, sporangiophore, sporangium; papilla, septum, plug, pedicel, vacuole, and germination of the sporangium; organs of fusion, monocliny, monoecism, and homothallism, as applied to the genus *Phytophthora*, are defined, illustrated, and described in an attempt to standardize the terminology of this genus, particularly as it is used in diagnoses.

STEVENS (N. E.). **Factors in botanical publication and other essays.**—*Chron. bot.*, 11, 3, pp. 119–204, 1 pl., 1947. $2. [Received, 1949.]

This special issue of *Chronica Botanica* is devoted to a collection of the general writings of the author on subjects lying on the borderland between the humanities and biology. Of the 17 essays presented, two of plant pathological interest have already been noticed in this *Review* [*R.A.M.*, 18, p. 580; 21, p. 330].

DILLON WESTON (W. A. R.) & STAPLEY (J. H.). **Diseases and pests of vegetables.**—74 pp., 32 figs., London, Longmans, Green & Co., Ltd., 1949. 4*s.* net.

This interesting and helpful book, prepared especially for farmers and students, comprises, *inter alia*, chapters describing in simple language the symptoms and control of pests and diseases of asparagus, cabbages and related plants, carrots, celery, lettuce, onions, potatoes, and tomatoes. There are numerous drawings and diagrams showing the life-cycles of the various fungi and insects by Ann Murray.

DILLON WESTON (W. A. R.). **Diseases of Potatoes, Sugar Beet, and Legumes.**—viii+86 pp., 26 figs., 1 map, London, Longmans, Green & Co., Ltd., 1949. 4*s.* net.

Prepared mainly to assist farmers and students and based largely on earlier articles by the same author in *J. Minist. Agric.*, this interesting and helpful book describes (with numerous illustrations by Ann Murray) the symptoms, life-cycle, and control of the principal diseases and pests of potatoes (six chapters), sugar beet and mangolds, beans, peas, and clover and lucerne (one chapter each).

MUNDKUR (B. B.). **Fungi and plant disease.**—x+246 pp., 130 figs., London, Macmillan and Co., Ltd., 1949.—16*s.* net.

This copiously and clearly illustrated text-book, intended for undergraduate students of mycology and plant pathology in India, describes the most important

and representative diseases of economic plants in that country. It comprises 12 chapters, dealing, respectively, with fungi, their morphology and reproduction; metabolic processes in fungi; diseases caused by fungi; methods of studying plant diseases; classification and naming of fungi; Phycomycetes; Ascomycetes; Basidiomycetes; Fungi Imperfecti; bacterial diseases of plants; virus diseases; and plant disease control.

OLIVE (L. S.). **Cytological evidence opposing the theory of brachymeiosis in the Ascomycetes.**—*Science*, 110, 2851, p. 185, 1949.

The writer, using the propiono-carmine staining technique of Wheeler *et al.* (*Amer. J. Bot.*, 35, p. 722, 1948) in a study on *Patella melaloma* at Louisiana State University, has shown that the third nuclear division in the ascus is non-reductional and that brachymeiosis does not occur.

GOIDÀNICH (G.) & BERNARDI (CARLA). **Sulle alterazioni dell' apparato radicale e del colletto prodotte da miceli di Basidiomiceti sterili.** [On injuries to the root system and collar caused by mycelia of sterile Basidiomycetes.]—*Ann. Sper. agr.*, N.S., 3, 3, pp. 657–664, 6 figs., 1949. [English summary.]

Attention is drawn to the parasitic activity of sterile Basidiomycetes in causing injuries to the roots and collar of certain plants. These fungi have a very fine vegetative mycelium which may easily be overlooked, especially if the material is examined some time after collection. On the host and in culture very thin rhizomorphic threads develop. Four cases of injury of this type are described, one on a group of *Philadelphus coronarius* plants at the Plant Pathology Station, Rome, from which the condition spread to *Cynodon dactylon* plants growing in the vicinity, a second on box (*Buxus sempervirens*) in the same locality and at Castel Gandolfo caused by a Basidiomycete of the same type as the foregoing, a third near Cagliari on barley causing a wilt, the mycelium resembling that observed on wilted grasses in America [*R.A.M.*, 23, p. 348], and a fourth near Rome on cabbage plants with a root rot associated with a fungus resembling that found on barley and having bright, fan-shaped rhizomorphs like those of *Rosellinia* [? *necatrix*].

WOODWARD (R. C.). **Seed dressings.**—*Plant Prot. Overs. Rev.*, 1, 2, pp. 13–17, 1949.

In this popular review of seed dressings the author states that the fungicidal efficiency of organo-mercurial preparations is not impaired by the addition of gammexane gamma-BHC (as in agrosan GN), effective against wireworms.

NYGAARD (G.). **A simple micromanipulator.**—*Science*, 110, 2850, pp. 165–166, 1 fig., 1949.

A device for the isolation of one microscopic cell is described. The fine capillary pipette, generally used for this purpose, can be fastened to the microscope objective by means of a metal, ebonite, or plastic block 55 by 15 by 10 mm. At one end there is a vertical hole for the objective with a deep incision and a threaded bolt, which enables the block to be tightened round the objective. On the side wall at the other end the pipette is fixed vertically against the block by a retaining plate with three screws and protected by felt or thin cork glued to the block and the plate.

The pipette is a 5 mm. glass tube with one end drawn to a long, thin point, 25 to 500 μ wide, and bent to about 135° with the tube. Cemented into the other end is a small, high nut with a threaded bolt which must be greased and air-tight. The selected pipette is adjusted in position so that its mouth is in the centre of the microscope field (at $\times 100$) and the point is almost horizontal. A column of sterile water of convenient length is drawn up. Then by means of the mechanical stage the organism selected is moved before the mouth of the pipette. A turn of the screw

carries the cell into the pipette and a counter turn will eject the contents where desired.

Dade (H. A.) & Waller (S.). **New techniques for mounting fungi.**—*Mycol. Pap., Commonw. mycol. Inst.*, 27, 5 pp., 1 fig., 1949. 1*s.* 6*d.*

Details are given of the composition and use of Wallers Cement No. 1, a new preparation for sealing microscope slides, and of Wallerite, a new mounting medium for fungi formulated by the second author.

Waller's Cement No. 1 consists of a mixture of equal quantities of gum dammar and bees-wax, with the addition of not more than 5 per cent. gold size, which must be of good quality. The wax and dammar are melted separately and the former poured into the latter, stirring thoroughly; finally the gold size is added. The cement hardens in a moment, is resistant to lactophenol, forms a strong tough seal, and in tests withstood a temperature of 35° C. The cement is applied with a sealing tool consisting of a wooden handle and a brass stem, to which is riveted a flat brass bit, fixed at right angles to the shaft and filed on one side to a fine edge which is slotted by eight cuts. The other side of the bit is rounded off. The bit is heated in a Bunsen flame, the slotted edge pressed deeply into the cement, the excess shaken off, and the edge applied to each edge of the cover slip in turn. The bit is again heated and the cement flattened out with the rounded back. Wallerite mounting medium consists of gelatine 10 gm., phenol crystals 28 gm., and glacial acetic acid 28 c.c. plus 10 drops of glycerol.

Verrier (L.). **A pressure-cooked non-moulding adhesive flour paste.**—*Nature, Lond.*, 164, 4169, p. 545, 1949.

Seventy-five gm. wheat flour and one gm. powdered alum are stirred into 500 c.c. of a 1 in 1,000 aqueous solution of mercury perchloride (liquor hydrargyri perchlor.) at room temperature; the mixture is heated in a pressure-cooker for ten minutes and then briskly beaten. This adhesive is of uniform consistency, resists moulds even under tropical conditions, and is not poisonous.

Goidànich (G.). **Caratteristiche generali della micoflora della pasta-legno.** [General characteristics of the mycoflora of wood pulp.]—*Ann. Sper. agr.*, N.S., 3, 2, pp. 399–414, 7 figs., 1949. [English summary.]

This is a full account of information which has already been noticed from another source [*R.A.M.*, 28, p. 320].

Schulz (A.). **Anwendung von Konservierungsmitteln zur Schimmelbekämpfung bei Brot.** [The use of preservatives in combating mould in bread.]—*Getreide, Mehl u. Brot*, 2, 9–10, p. 93, 1948. [Abs. in *Food Sci. Abstr.* (formerly *Index Lit. Food Invest*), 21, 5, p. 336, 1949.]

The growth of moulds on bread was prevented by 0·1 per cent. formic, propionic [*R.A.M.*, 21, p. 342], or butyric acids and by a concentration of 0·3 to 0·5 per cent. acetic acid. The addition of 0·5 per cent. calcium propionate (calculated on flour basis) had no effect on fermentation or quality and enabled bread to be kept for 10 to 14 days under conditions favourable to mould development, while 1 per cent. calcium propionate enabled it to be kept for 90 days but induced an acid, though not unpleasant, flavour. When propionic acid bacteria were added to the bread in a short sour dough method, the propionic acid content of the dough increased to from 0·2 to 0·25 per cent. and the bread kept very well.

Atkin (L.), Moses (W.), & Gray (P. P.). **The preservation of yeast cultures by lyophilization.**—*J. Bact.*, 57, 6, pp. 575–578, 1949.

Studies on the effect of lyophilization on cultures of brewers' yeast [*Saccharo-*

myces cerevisiae], carried out at the Wallerstein Laboratories, New York, showed that they may undergo marked changes as a result of the process. In several instances, the bios or growth factor requirements of cultures isolated after lyophilization showed changes indicating a mutation or segregation of characters. One isolate appeared to lose the ability to synthesize pantothenate at the same rate as its parent, and also grew more poorly without vitamins B_1 and B_6. Another lost the ability to grow as well as did the parent strain in the absence of pantothenate, inositol, and B_1 or B_6. Variants were found in over 50 per cent. of the revitalized cultures examined by this technique.

In conclusion, it is suggested that lyophilization should be carefully tested before being adopted as a method of yeast culture preservation.

Davis (W. W.), Parke (T. V.), & Daily (W. A.). **A linear diffusion method suitable for large scale microbiological antibiotic assay.**—*Science*, 109, 2839, pp. 545–546, 1949.

A diffusion method of microbiological assay is described. Pyrex glass capillaries with an internal diameter of 1 mm. and $3\frac{1}{2}$ in. long are ground flat at one end. They are partly filled with melted agar seeded with test organisms by means of an automatic device which flattens the end of the agar column flush in the end of the capillary. This flat end of the agar serves as the initial boundary for diffusion and for the measurement of inhibition zone length. Two capillaries are placed in a stoppered test tube to which about 2 to 4 ml. of a dilution of the antibiotic in nutrient broth has been added. By a proper choice of test organisms and nutrient solution for each class of antibiotics it is possible to find conditions which provide a sharp zone of intense aerobic growth of the test organism at the upper end of the capillary. Beyond this zone no visible growth occurs. When the seeded agar is made with nutrient broth, the linear relation of log concentration versus zone length is approximated over the range from under 1 unit to above 1,000 units per c.c. of streptomycin.

The method has been applied successfully to the assay of streptomycin, dihydrostreptomycin, penicillin-G [*R.A.M.*, 26, p. 557], and an alkyl thiomethylpenicillin using *B*[*acillus*] *subtilis* spores. A standard curve is drawn from a series of known dilutions of the antibiotic and the potencies of the unknowns are referred to this curve.

Leben (C.) & Keitt (G. W.). **Laboratory and greenhouse studies of antimycin preparations as protectant fungicides.**—*Phytopathology*, 39, 7, pp. 529–540, 1 fig., 5 graphs, 1949.

Various crude preparations of antimycin derived from cultures of an unidentified species of *Streptomyces* [*R.A.M.*, 28, p. 231] proved effective in greenhouse tests at the Wisconsin Agricultural Experiment Station in the control of apple scab (*Venturia inaequalis*) and tomato early blight (*Alternaria solani*). Some of these preparations were comparatively resistant to washing, whereas crystalline antimycin A was easily removed from the leaves by simulated rain in experiments by the leaf disk assay method. There was a decline in antibiotic activity on the foliage with the passage of time. Antimycin appears to be non-toxic to the plants and compatible with various insecticides.

Vaughn (J. R.), Lockwood (J. L.), Randwa (G. S.), & Hamner (C.). **The action of actidione on plant tissue and upon certain fungi.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 31, 4, pp. 456–464, 13 graphs, 1949.

In experiments carried out in Michigan, actidione [*R.A.M.*, 28, p. 266] at 10 p.p.m. controlled bean [*Phaseolus vulgaris*] mildew (*Erysiphe polygoni*) and rose mildew [*Sphaerotheca pannosa*] under greenhouse conditions. There was no sign of

toxicity to beans at these concentrations or lower but injury was very pronounced on certain varieties of roses, especially on young leaves. Rose mildew was controlled by concentrations of less than 5 p.p.m. but injury to the new foliage was still apparent. Before this material is used on a large scale further information is required concerning the timing of sprays, the use of spreaders and stickers, and the toxicity to various rose varieties. Extensive tests are being conducted to determine the differences at various concentrations in the toxicity of actidione to seeds.

The growth in culture of *Sclerotinia fructicola*, *Cladosporium cucumerinum*, *Fomes* sp., *Alternaria* sp., and *Colletotrichum lagenarium*, was strongly inhibited by concentrations of 100 p.p.m. of actidione in the agar medium. Several fungi were markedly inhibited by concentrations as low as 5 p.p.m. These results indicate that actidione merits extensive testing against phytopathogenic fungi both in the laboratory and in the field.

Brian (P. W.), Curtis (P. J.), Hemming (H. G.), Unwin (C. H.), & Wright (Joyce M.). **Alternaric acid, a biologically active metabolic product of the fungus Alternaria solani.**—*Nature, Lond.*, 164, 4169, p. 534, 1949.

From culture filtrates of a strain of *Alternaria solani* the authors isolated a material, 'alternaric acid', which caused characteristic stunting of developing germ-tubes of *Botrytis allii* [*R.A.M.*, 27, p. 146] and inhibited spore germination of other fungi. The antifungal activity of this product is remarkably specific. It inhibits spore germination in *Absidia glauca*, *Myrothecium verrucaria*, and *Stachybotrys atra* in the range 0·1 to 1 μgm/ml., but the percentage germination of spores of *B. allii*, *Fusarium caeruleum*, and *Penicillium digitatum* is unaffected by concentrations as high as 200 μgm/ml. When introduced, in concentrations of 5 to 10 μgm/ml., into nutrient solutions in which tomato, pea, beet, radish, cabbage, mustard, and carrot seedlings were growing, it caused in seven to ten days a fatal wilt of the radish, cabbage, mustard, and carrot seedlings, though the others remained apparently unaffected. When radish, mustard, tomato, clover, and wheat seeds were incubated on agar containing the substance, growth of the radish, mustard, and tomato seedlings was severely retarded by 1 to 5 μgm/ml. alternaric acid, though wheat and clover were more resistant.

Dulaney (E. L.), Ruger (Myrle), & Hlavac (C.). **Observations on Streptomyces griseus. IV. Induced mutation and strain selection.**—*Mycologia*, 41, 4, pp. 388–397, 1 fig., 1 diag., 1949.

In studies carried out in New Jersey, normal variation in *Streptomyces griseus*, including the production of such characters as spore colour, the numbers of spores, colony form, sectoring, and exudation, the pigmentation of the substratum, and amount of streptomycin produced, was increased by treatment with either ultraviolet light or 2,2′, 2″-trichloro-triethylamine. The results indicated that strain selection and induced mutation can be used to obtain strains with an increased capacity for producing streptomycin.

Mehrotra (B. S.). **Physiological studies of the genus Phytophthora. 1. Enzyme action.**—*J. Indian bot. Soc.*, 28, 2, pp. 108–124, 1949.

These studies were concerned with the assessment of the more important extra- and intracellular enzymes present in the mycelia of five species of *Phytophthora*, namely, *P. cactorum*, *P. citricola* [*P. cactorum*], *P. parasitica*, and its two vars. *piperina* [*R.A.M.*, 28, p. 591] and *nicotianae*. Uniformity was ensured by the consistent use of a single medium (2 per cent. malt extract solution at pH 6·8) at 25° to 28° C., the method employed by Nutman for wood-destroying fungi [ibid., 8, p. 536]. The enzymes were estimated by two qualitative methods and one

quantitative method. The enzymes occurring both intra- and extracellularly included amylase, maltase, emulsin, cellulase, hemicellulase, invertase, and raffinase. Amylase, raffinase, maltase, cellulase, and hemicellulase were more active, extracellularly, than internally, while for invertase, emulsin, lipase, butyrase, catalase, and proteolytic enzymes the position was reversed. Of the species tested the two strains of *P. cactorum* showed the highest degree of enzymatic activity. All the species tested reduced the pH of the medium from 6·8 to between 3·8 and 4·1.

Lilly (V. G.) & Barnett (H. L.). **The effect of pyrithiamin upon sporulation of three thiamin-deficient fungi.**—Abs. in *Amer. J. Bot.*, 35, 10, p. 801, 1948.

Experiments carried out in West Virginia showed that pyrithiamine inhibited sporulation of the thiamine-deficient fungi *Ceratostomella fimbriata* [*R.A.M.*, 27, p. 405], *Choanephora cucurbitarum*, and *Chaetomium convolutum* at a concentration lower than that required to inhibit vegetative growth completely. Less pyrithiamine was required to inhibit perithecial formation by *Ceratostomella fimbriata* than to prevent conidial formation.

Review of work on Potato virus diseases.—*Rep. Rothamst. exp. Sta., 1947*, pp. 101–106, 1948.

This article reviews the work carried out at Rothamsted on potato virus diseases since 1940, most of which has been noticed in this *Review*.

Stapp (C.). **Die serologische Virusdiagnose und ihre Bedeutung für den Kartoffelbau.** [Serological virus diagnosis and its importance for Potato cultivation.]—*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, *1943*, 67, pp. 6–30, 7 figs., 8 diags., 1943. [Received October, 1949.]

This is a tabulated survey and discussion of the results obtained by the author and others with the serological method for the diagnosis of plant viruses, with special reference to its application in the study of those affecting the potato [*R.A.M.*, 23, p. 496; 28, p. 413]. This simple and expeditious technique is regarded as superior in specificity to all other procedures hitherto devised for the identification, differentiation, and classification of the viruses concerned in degeneration from the standpoint of potato cultivation and breeding.

Clinch (Phyllis E. M.) & McKay (R.). **A further experiment on the effect of mild strains of virus X on the yield of Up-to-Date Potato.**—*Sci. Proc. R. Dublin Soc.*, N.S., 25, 8, pp. 93–99, 1949.

During 1948 a further field trial [cf. *R.A.M.*, 26, p. 413] was conducted in Eire to test the effect of two different mild strains of potato virus X on the cropping capacity of Up-to-Date potatoes, using two clones of healthy tubers derived originally from two virus-free Up-to-Date tubers and the same clones infected with virus X. Weather conditions were especially favourable for potatoes throughout the trial, each statute acre yielding, on an average, 26½ tons. Both strains of virus X caused a significant reduction in the yield from one clone (12 and 8 per cent. for the two virus strains). The infected plants of clone II, however, yielded as well as the virus-free clones, as did also the infected Up-to-Date stocks from which the virus strains had been derived.

The results so far available indicate that in so far as cropping capacity is concerned, different clones of a potato variety react differently to infection with mild strains of virus X, and that in some cases the nature of the reaction may be considerably affected by environmental conditions.

Bonde (R.) & Schultz (E. S.). **Control of late-blight tuber rot.**—*Bull. Me agric. Exp. Sta.* 471, 16 pp., 5 figs., 1949.

Observations in Maine from 1942 to 1945 showed that potato tubers from fields where the tops have been completely killed early in the season by blight [*Phytophthora infestans*: *R.A.M.*, 25, p. 276; 28, p. 139] usually develop little or no decay in storage, whereas the percentage decay in tubers from fields with little foliage blight is often high. A small amount of infection may cause a great deal of tuber decay if disseminated to the tubers during harvesting, and in Aroostook County most of it arises in this way. In experiments carried out from 1942 to 1945, the disease was kept under control by spraying in fields of Green Mountain and Katahdin potatoes, but some infection was allowed to develop late in the season. The crop was harvested every year after 15th September, part when some infected green stalks and leaves remained and part when the plants had been killed by frost, all tubers being placed in commercial storage immediately. Eight weeks later in the tubers harvested earlier the rot percentage ranged from 10 (in 1945) to 53 (1944). In those harvested later the figures ranged from zero in 1942 and 1945 to 6 per cent. in 1944.

In 1943, six weeks after harvesting, 40 per cent. of Katahdin tubers from green, unsprayed plants developed late blight in storage, compared with 5·9 in tubers dug after the tops had been killed by frost, and 3 in those harvested ten days after the plants had been killed by spraying with sinox plus ammonium sulphate. In 1944 the corresponding figures were 54, 0, and 3 per cent. In 1947, 43 per cent. tuber rot occurred in tubers from untreated plants, 6 per cent. in tubers from those sprayed with copper sulphate and harvested two days later, and 26 per cent. in those dug ten days after spraying, the corresponding figures for sodium arsenite (handy killer) being 3 and 4 per cent. It is advisable, therefore, to harvest tubers from plants treated with copper sulphate immediately after spraying.

In 1948, Green Mountain potatoes harvested from untreated plants on 27th August had 21·1 per cent. tuber decay, 6·5 per cent. occurred in those whose tops had been destroyed with a rotobeater two days before harvesting, 0 per cent. in those killed with the rotobeater and then sprayed with sinox general plus diesel oil (2 pts.: 3 gals.: 100 gals. water), and 1 per cent. in those treated with the herbicide alone. The corresponding figures for Katahdin were 7·9, 2·1, 1·4, and 2·4 per cent. While the rotobeater is on the whole effective it is advisable to spray with herbicide any plant parts which escape killing. Since the application of DDT delays the maturity of potato haulms, widespread use of this material increases the danger of infection from blight.

The best method of control probably consists in growing resistant or immune varieties. Experimental evidence, obtained from 1936 to 1947 inclusive, demonstrated that the susceptible varieties Green Mountain and Katahdin developed a considerable percentage of rot when harvested under conditions favourable to the fungus (hand digging before the foliage had been killed by frost) while the resistant Sebago, Kennebec, Saranac, and seedling 336–18 developed none.

Muncie (J. H.) & Morofsky (W. F.). **Field tests of fungicide-insecticide combinations in Michigan for 1948.**—*Amer. Potato J.*, 26, 8, pp. 287–291, 1949.

In further field trials carried out at Lake City, Michigan, using Katahdin potatoes and several spray and dust combinations [cf. *R.A.M.*, 27, p. 581], copper zinc chromate [ibid., 28, p. 352] gave the best control of early blight [*Alternaria solani*] among the sprays, closely followed by zerlate, dithane D-14, yellow cuprocide, and cuprous oxide, while in the dusting trials zerlate, copper zinc chromate, copper 8-quinolinolate, tribasic copper sulphate, dithane Z-78, and zinc nitrodithioacetate [loc. cit.] gave very good control. Early blight readings in a second plot of mixed

varieties using certain dusts showed that the best control was obtained with copper zinc chromate (35 per cent. defoliation).

McKay (R.). **The susceptibility of some Potato varieties to common scab (Actinomyces scabies (Thaxt.) Güssow) in different soils.**—*Sci. Proc. R. Dublin Soc.*, N.S., 25, 6, pp. 65–84, 2 pl., 2 graphs, 1 map, 1949.

From 1941 to 1946, 65 potato varieties were tested for susceptibility to common scab, *Actinomyces scabies* [*R.A.M.*, 16, p. 488] in trials carried out in semi-permanent plots, treated with scabbed peelings and farmyard manure each year, at four Agricultural Stations situated in various parts of Eire, each receiving different amounts of rainfall. The soils differed in origin, the pH range being 5·2, 5·9, 6·9, and 7·9, although the fertility status of the four soils was fairly uniform.

All the varieties tested scabbed badly at one or other of the four Stations, Up-to-Date and Majestic being the most susceptible; Di Vernon, the least affected, was scabbed to the extent of 89 per cent. by weight and having 20 per cent. severe scab (with more than one-quarter of the tuber surface affected). Ulster Chieftain, Edzell Blue, and Doon Early came next with 20 to 30 per cent. severe scab. Golden Wonder, usually scab-free, was 100 per cent. (86 per cent. severe) scabbed at Clonakilty, although scab-free at Glasnevin. Russet skin does not appear to confer any resistance on Field Marshal.

The first year of the trials was the driest of the period and was the most favourable for scab development. The high rainfall and consequent reduction in the amount of oxygen in the heavier soils at Athenry, Ballyhaise, and Glasnevin were mainly responsible for the considerable drop in infection in 1942 at these Stations. There was much more scab at Clonakilty in 1942 than in the previous year, probably owing to the light, gravelly soil where waterlogging would be unlikely to occur.

Sunken scab was usually predominant but at Clonakilty in 1944 scab was practically all of the raised type. Only the Clonakilty plot showed any increase in scab due to continued cropping with potatoes, although want of rotation definitely increased the amount of black scurf (*Corticium solani*) [ibid., 23, p. 76] at all Stations, of powdery scab (*Spongospora subterranea*) [ibid., 19, p. 198; 23, p. 80] at Athenry, and of silver scurf (*Spondylocladium atrovirens*) at Ballyhaise.

Sprau (F.). **Über das Auftreten der sog. Pustelfäule an Kartoffeln.** [On the occurrence of the so-called pustule rot on Potatoes.]—*Pflanzenschutz*, 1, 11, pp. 131–132, 2 figs., 1949.

In the spring of 1949 seed potatoes of the Böhms Allerfrüheste Gelbe variety from moorland soil, which had overwintered in clamps in Bavaria, were found to be infected by powdery scab (*Spongospora subterranea*). The disease has attracted little attention in Germany since 1920 [*Arb. Forschungsinst. Kartoffelbau*, 2, pp. 51–60]. Its symptomatology and etiology are accordingly described from the relevant literature, with special reference to the studies of Shapovalov in the United States [*R.A.M.*, 2, p. 389].

Goidànich (G.). **Fenomeni di sterilità in Patate da semina di provenienza olandese.** [Sterility phenomena in seed Potatoes from Holland.]—*Ann. Sper. agr.*, N.S., 3, 3, pp. 639–655, 10 figs., 1949. [English summary.]

A full description is given of three types of failure observed in 1948 in Bintje potatoes imported into Italy from Holland. In the first, prevalent in Sicily and southern Italy, the buds produced in store short runners ending in a small tuber. The second type, commonest in late sowings in northern areas, was due to a rotting of the seed-piece. Frequently associated with the rot was a species of *Clonostachys*

[see next abstract], which appeared to have established itself in a pathogenic capacity. The third and much the least common type of failure resembled spindle sprout, long, thin sprouts giving rise to very weak plants; no tubers were produced and the seed-piece was abnormally persistent.

The author considers that the abnormal condition of the tubers in the first two cases was probably due to the effect upon the mother plants of the serious drought which occurred in northern Europe in 1947 and was further aggravated by the exceptional weather which prevailed during storage and sprouting. It is uncertain if the third type of failure can be ascribed to these causes.

Pettinari (Carla). **Azione patogena della Clonostachys araucariae Corda var. rosea Preuss su tuberi di Solanum tuberosum.** [The pathogenic action of *Clonostachys araucariae* Corda var. *rosea* Preuss on tubers of *Solanum tuberosum*.]—*Ann. Sper. agr.*, N.S., 3, 3, pp. 665–672, 9 figs., 1949. [English summary.]

Potatoes in Italy are increasingly infected by white mycelium surrounded by darkened, necrosed areas. In culture on carrot agar, potato glucose agar, or small pieces of potato, the mycelium, after four days, is white, loose, and cottony. After 20 days the fructifying mycelium is compact, reddish-white, and appears cheesy owing to the presence of large masses of conidia. The sterile, creeping hyphae average 2·5 μ and the fertile, non-creeping hyphae 3 μ in diameter. The latter bear erect candelabrum-like conidiophores with three verticils measuring 25 μ in length. The three segments of the first verticil average 11 μ long and 3 μ in diameter; the nine segments of the second 6 μ by 2·5 μ and those of the third 8 μ by 1·5 μ. A drop of mucus appears in culture over every conidiophore whatever its stage of development. As a rule, two or three conidia form a chain at the apex, while the others are in the drop of mucus. The conidiophores in colonies on infected tubers have the same structure and dimensions, but the conidia occur in long lines, forming a sort of 'ear'; this arrangement also occurs on tubers experimentally infected with culture material. The hyaline, oval conidia average 4·5 by 2 μ. From these characters the fungus is identified as *Clonostachys araucariae* var. *rosea* [cf. *R.A.M.*, 7, p. 723; 11, p. 737; and preceding abstract].

Inoculations of the surface of freshly cut tubers caused characteristic lesions to develop, affecting the outer layers of the parenchyma. When whole, young or mature tubers were immersed in a conidial suspension of the fungus and allowed to dry, after five days, dark sunken spots developed which averaged 3 mm. in diameter on young tubers and 1·5 mm. on fully grown ones; necrosis of the cortical layers was noted. When a superficial wound cut tangentially in young tubers was inoculated, after seven days superficial infection developed with mycelium and extensive necrotic areas, which affected a large part of the surface. When young and fully grown tubers were infected through a deep perpendicular wound or internally, by cutting off a piece and then covering the inoculation wound with the piece, 14 days later they displayed diffuse internal necrosis, the parenchymatous tissue being ruptured in places where it had been killed by the fungus. Tissues so affected were scaly and dry. With both types of wound the behaviour of young and fully grown tubers was the same; even in fully grown tubers infection spread rapidly, in spite of the formation of an irregular, frequently broken line of wound meristem. When entire shoots of germinated tubers were inoculated complete necrosis of the tissues occurred after four days. The fungus was reisolated from the infected material.

The protection of stored seed Potatoes.—*World Crops*, 1, 2, pp. 63–65, 4 figs., 1949.

The author lists the principal fungus diseases which attack stored seed potatoes in Britain. Most of the information on the treatment of stored seed potatoes with

fusarex against *Fusarium caeruleum*, the most important of these diseases, has already been noticed from another source [*R.A.M.*, 28, p. 140]. The collated results of five years' experiments showed that after treatment and storage tubers are very firm and dry. After four to six weeks' storage, dispatching, and boxing Arran Pilot potatoes treated at 10 lb. per ton on carting from the field showed before planting in the following year only 1·1 to 2·5 per cent. infection, as against 3 to 20 per cent. for untreated, while the corresponding figures for May Queen were 0·78 to 5 as against 9 to 25, for Doon Star 0·3 to 4 and 4 to 14·7, for Dunbar Rover 0·1 and 0·7, and for Duke of York 0·2 and 0·7 per cent. Treated Arran Pilot 'seed' yielded 10 tons per acre, as against 9 tons 2 cwt. for untreated. It is essential to keep the tubers in closed storage for a minimum period of four to six weeks after treatment.

Martin (W. J.), Lutz (J. M.), & Ramsey (G. B.). **Control of black rot in washed, uncured Sweet Potatoes.**—*Phytopathology*, 39, 7, pp. 580–582, 1949.

Particulars are given of shipping and holding tests carried out in Louisiana and Chicago in 1948 to determine the applicability of the 1 per cent. borax dip treatment for the control of sweet potato black rot (*Ceratostomella fimbriata*) [*R.A.M.*, 28, p. 111] under commercial conditions. The percentages of infection developing in treated and untreated crates from 11 lots of washed, uncured sweet potatoes stored for ten days at the Louisiana Agricultural Experiment Station were 0 and 8, respectively. An emulsion wax containing 2 per cent. dowicide A (sodium orthophenylphenate) proved ineffectual for the purpose in view.

Ciccarone (A.) & Platone (E.). **Notizie su Sclerotium rolfsii Sacc. in Venezuela e prove preliminari per la lotta.** [Information concerning *Sclerotium rolfsii* Sacc. in Venezuela and preliminary experiments on its control.]—*Riv. Agric. subtrop. trop.*, 43, 4–6, pp. 71–80, 2 graphs, 1949.

In Venezuela field crops of potatoes [*R.A.M.*, 19, p. 673], tomatoes, sugar-cane, groundnuts, and sorghum are subject to attacks of varying severity by *Sclerotium rolfsii*. Sorghum, although slightly affected by *S. rolfsii* in marshy soil, was commonly resistant and in one instance the crop limited the development of the fungus in fields where it was grown in alternate rows with tomatoes.

Cultural operations in infested soil appeared to accentuate the severity of the damage; earthing-up, for example, was dangerous, allowing the fungus, under favourable conditions, to come in contact with the stem above the collar.

In preliminary experiments on the control of the fungus, Petri dishes each containing 10 mature sclerotia on filter paper were treated for 12 hours at 25° C. with formalin solutions at various concentrations. The highest concentration used (1·5 per cent.) killed 77 per cent. of the sclerotia without direct contact.

Padmanabhan (S. Y.), Chowdhry (K. R. R.), & Ganguly (D.). **Helminthosporium disease of Rice. 1. Nature and extent of damage caused by the disease.**—*Indian Phytopathology*, 1, 1, pp. 34–47, 1949.

A description is given of *Helminthosporium oryzae* (*Ophiobolus miyabeanus*), based on collections from rice in Bengal [*R.A.M.*, 27, p. 294] and compared with the data presented by other workers. Grain weight is definitely reduced as a result of infection by *O. miyabeanus*, both in the Aman and Aus groups of varieties. Under laboratory conditions, moreover, the germinability of the diseased seeds was lower than that of sound ones, but the differences were not reflected in field trials. Further, there was no appreciable drop in yield from the use of infected seed in normal years, when the fungus behaves as a weak parasite, but in epiphytotic seasons heavy losses may be sustained. For instance, the destructive outbreak of the disease in 1942–3 was responsible for substantial reductions of yield compared

with the previous season (up to over 90 per cent.) in most of the 23 varieties cultivated at two Rice Research Stations. The losses sustained by the two most resistant varieties Kataktara and Bhutmuri were 15·1 and 6·83 per cent., respectively.

WADE (G. C.). **The control of boron deficiency.**—*Tasm. J. Agric.*, 20, 3, pp. 197–200, 3 figs., 1949.

Details are given of the symptoms and control of boron deficiency of apples [*R.A.M.*, 26, p. 158], pears [ibid., 26, p. 17], turnips, and swedes [ibid., 20, p. 616] in Tasmania.

BOTTINI (E.). **I microelementi dei terreni agrari. Nota I. Il boro nella vita vegetale.** [The micro-elements of agricultural soils. I. Boron in relation to plant growth.] —*Ann. Sper. agr.*, N.S., 3, 2, pp. xiii–xl, 1949. [English summary.]

The author discusses the possible mode of diffusion of boron in the soil and its distribution in plants [*R.A.M.*, 28, p. 195] and describes the physiological disorders produced in various plants by boron deficiency, the toxic effect of excess boron on plant development, the physiological functions of the element in the various stages of plant growth, and the methods of administering it to cultivated plants.

COHEN (C.). **Fungi as indicators of soil conditions ; soil fungi from South Africa.**—*Nature, Lond.*, 164, 4166, pp. 408–409, 1949.

Using Waksman's method [*R.A.M.*, 1, p. 233] and a new one, somewhat similar to Winogradski's for bacteria (*Proc. 1st int. Congr. Microbiol.*, 1, p. 110, 1930), in which 250 gm. samples were kept at 40 per cent. of their maximum water-retaining capacity at room temperature, the author attempted by the isolation of fungi from the upper six inches of soil to determine the differences in a series of experimental plots in the Transvaal Highveld, which for seven years had been subject to different cultural treatments.

The results showed that soil fungi may be used as indicators of soil conditions resulting from cultural treatments. It is tentatively concluded that burning followed by light grazing, after which the numbers of fungi were higher than in untreated plots, was the least injurious, while burning alone was harmful, directly or indirectly. A list is given of the fungi isolated, in which Phycomycetes, Ascomycetes, and Fungi Imperfecti are represented.

RAMAKRISHNAN (T. S.) & SOUMINI (C. K.). **Wilt disease of Pyrethrum.**—*Indian Phytopathology*, 1, 1, pp. 27–33, 2 figs., 1948.

A wilt disease of *Chrysanthemum cinerariaefolium* prevalent in plantations on the Palni Hills (Madras Province) was found to be associated with *Phytophthora cambivora*, *Rhizoctonia* [*Corticium*] *solani*, and a species of *Fusarium*. The two former were pathogenic to the host in inoculation experiments, while the last-named failed to attack healthy plants. The cultural characters of the organisms and their effects on the plant are described.

BISBY (G. R.). **Generic names of fungi proposed for rejection.**—*Mimeogr. Publ., Commonw. mycol. Inst.*, 6, 59 pp., 1949. 3*s.* 6*d.*

This list, containing more than 1,200 generic names which are invalid for various nomenclatural reasons, is set out in the hope that a future International Botanical Congress may appoint a committee to reject those no longer required.

HUGHES (S. J.). **Studies on micro-fungi, I. The genus Fusariella Saccardo.**—*Mycol. Pap., Commonw. mycol. Inst.*, 28, 11 pp., 5 figs., 1949. 2*s.* 6*d.*

The type species of the generic name *Fusariella*, *F. atrovirens*, is re-described

from the co-type collection on *Allium* sp. in Italy. Three other species are recognized and re-described, *F. bizzozeriana* (≡ *Sporidesmium bizzozerianum* Sacc.) originally recorded on *Erythrina crista-galli* in Italy, *F. concinna* (≡ *Clasterosporium concinnum* Sydow) on *Ficus religiosa* in India, and *Fusariella obstipa* (*Dendryphion obstipum* Pollack), isolated from a dried tuber of *Colocasia esculenta* intercepted from China in February, 1946 [cf. *Mycologia*, 39, 5, pp. 617–621, 1 fig., 1947]. An isolation from orange rind at Mazoe, Southern Rhodesia, by G. R. Bates in 1938 is described; it may be a new species. The generic name *Fusariella* is applied to species which form chains of phaeophragmoconidia in basipetal succession from the apex of phialides. A diagnostic character is that the apex of all the conidia except the apical one is deflected laterally. Three species with names in *Fusariella* are rejected.

O'Connor (P.). **A further contribution to knowledge of the Irish fungi.**—*Sci. Proc. R. Dublin Soc.*, N.S., 25, 4, pp. 33–53, 1949.

This list of about 500 fungi collected in Ireland [including Northern Ireland: cf. *R.A.M.*, 16, p. 128] during the years 1935 to 1948, includes *Phyllosticta grossulariae* and *Septoria ribis* on black currant and *Ramularia pastinacae* on parsnip, all of which appear to be new records for Ireland.

Thirumalachar (M. J.). **Critical notes on some plant rusts.**—*Bull. Torrey bot. Cl.*, 76, 5, pp. 339–342, 7 figs., 1949.

Although the genus *Uleiella* has been doubtfully placed under either rusts or smuts, the author, after studying the morphology of the spores of authentic specimens of *U. paradoxa* and *U. chilensis* deposited in the Mycological Collections of the U[nited] S[tates] D[epartment of] A[griculture], considers that the genus does not belong to either group.

Olive (L. S.). **A cytological study of typical and atypical basidial development in Gymnosporangium clavipes.**—*Mycologia*, 41, 4, pp. 420–426, 14 figs., 1949.

A recent study of some slides of germinating teleutospores of *Gymnosporangium clavipes* prepared in 1941 by the author in the Department of Botany, Bacteriology, and Plant Pathology, Louisiana State University, revealed that a few of the basidiospores were quadri- instead of binucleate and that they were somewhat larger than the normal, binucleate ones. Accordingly this study was made to determine how such spores are produced and their significance in the life history of the rust. Basidia producing such spores were found to be three celled, one of the cells being binucleate and the other two uninucleate. The binucleate cell gave rise to a binucleate basidiospore, which later became quadrinucleate, and which is believed to be heterokaryotic in most cases. It is suggested that such an atypical spore might infect the Rosaceous host producing a dikaryotic mycelium and aecidia, or there is the less likely possibility that it might be able to infect *Juniperus virginiana*.

Mezzetti (A.). **Ricerche sulla biologia della Melanospora damnosa (Sacc.) Lindau. III Contributo. Ricerche morfologiche.** [Researches on the biology of *Melanospora damnosa* (Sacc.) Lindau. Contribution III. Morphological researches.]—*Ann. Sper. agr.*, N.S., 3, 1, pp. 153–170, 3 pl., 8 figs., 1949. [English summary.]

The morphology of *Melanospora damnosa* has been re-examined [cf. *R.A.M.*, 28, p. 300], using a strain isolated from the same habitat as that (now lost) on which the species was originally found. The morphological features were compared with the characters described in the literature for strains of different origin, on which all observations, subsequent to the original ones, have been made. Some differences are indicated.

In dual cultures of *Fusarium culmorum* and *M. damnosa* special morphological adaptations were noticed. The hyphae of *M. damnosa* tended to adhere to those of the symbiont, often by means of 'lateral appendages' while sometimes those of *F. culmorum* adhered to the promycelia of *M. damnosa* by similar appendages or by means of 'coiled hyphae'. Also the hyphae of *M. damnosa* showed special varicose swellings, probably due to some nutritional stimulus.

Mohanty (U. N.). **Studies on Indian Aspergilli.**—*Indian Phytopathology*, 1, 1, pp. 55–66, 6 figs., 1948.

On the basis of a critical study of the records of 33 species and two varieties of *Aspergillus* hitherto reported from India [*R.A.M.*, 11, p. 545; 18, p. 57] and of 52 cultures representing 19 species, the author admits the validity of only 20. Full descriptions are given of six species collected in India, viz., *A. fischeri*, *A. rugulosus*, *A. unguis*, *A. amstelodami* (all new records for the country), *A. nidulans*, and *A. variecolor*. Thus, the total number of Indian species of *Aspergillus* recognized as authentic is 24.

Ludwig (E. H.) & Hutchinson (W. G.). **A serological study of selected species of Actinomycetes.**—*J. Bact.*, 58, 1, pp. 89–101, 1949.

Studies carried out at the University of Pennsylvania on the development of serological methods applicable to members of the Actinomycetaceae and Streptomycetaceae and on the evaluation of such methods for their identification are reported. The organisms used included seven species of *Streptomyces*, one being *S.* (*Actinomyces*) *scabies*. A concentrated suspension of the organism was subjected to sonic vibrations (from a magneto-striction sonic oscillator, type R–221, Raytheon Manufacturing Company) for 30 to 40 minutes, which produced complete disintegration of the filaments and cells into very small fragments. The suspension displayed an even turbidity and varied in colour (white to grey, yellow, or lavender) with the species involved.

For use in the agglutination tests the concentrate was diluted with 0·85 per cent. sodium chloride to a standard turbidity corresponding to the no. 1 tube of the MacFarland scale. For the precipitin reaction samples of the suspensions of sonically treated cells were centrifuged and the uppermost clear liquid fraction was used as an antigen.

Groups of adult rabbits were immunized with the two types of antigen suspension, whole cells and sonically disintegrated cells. The macroscopic tube agglutination method was used throughout the work. The results obtained demonstrated that sonic vibrations may be used to produce an antigen suspension from the cells of Actinomycetes which is suitable for use in agglutination and precipitin studies on members of this group. The antigen suspensions so produced may be used successfully, following appropriate inoculation schedules, to produce in mature rabbits specific immune sera against the Actinomycetes. The techniques of agglutinin and precipitin reactions will probably be further developed and serve as aids in the identification of, and a means of demonstrating relationships within, the Actinomycetes.

Niethammer (Anneliese). **Die Gattung Penicillium Link. Merkmale, Leben, Verbreitung, Leistungen, Antibiose, Arten.** [The genus *Penicillium* Link. Distinguishing features, biology, distribution, activities, antibiosis, species.] —123 pp., 16 figs., Stuttgart/z.Z. Ludwigsburg, Verlag Eugen Ulmer, 1949.

Since Fleming's discovery of penicillin in 1929 [*R.A.M.*, 25, p. 571, *et passim*], many other species of *Penicillium* besides *P. notatum* have been found to secrete antibiotic substances of a similar nature. In this manual the author deals with these species with the object of extending present rudimentary knowledge of

antibiosis. The work falls into the following sections: (1) introduction; (2) concept of the genus; (3) condensed bibliography; (4) natural distribution of the species; (5) microscopic characters; (6) macroscopic cultural appearance; (7) pigmentation and iridescence; (8) physiological peculiarities; (9) substances contained in the cells and wall; (10) temperature and humidity requirements; (11) antibiosis or antagonism; (12) technical-medicinal importance of the genus; (13) conservation; (14) genetic observations; (15) culture and media; and (16) formulation and arrangement of the species (comprising pp. 38–113) in which descriptions and notes on a considerable number of species are given [cf. ibid., 17, p. 558; 28, p. 33]. A seven-page bibliography is appended.

Saksena (R. K.) & Bose (S. K.). **The chondriome in the genus Pythium.**—*Indian Phytopathology*, 1, 1, pp. 48–54, 1 pl., 1948.

The chondriome (mitochondrial contents of a cell or tissue) was investigated in 25 species of *Pythium* [cf. *R.A.M.*, 15, p. 244]. Granular, rod-shaped, and filamentous forms were all represented. For example, in *P. aphanidermatum*, *P. debaryanum*, and *P. mamillatum* the chrondriome was mostly granular; in *P. arrhenomanes* mostly rod-shaped; in *P. complectens*, *P. graminicola*, and *P. indigoferae* mostly filamentous; in *P. artotrogus* granular and rod-shaped mixed; and in *P. deliense* all three forms combined.

Silberschmidt (K.). **The effect of 'premunity' on the type of lesions induced by aucuba mosaic virus.**—*Tijdschr. PlZiekt.*, 55, 3, pp. 166–178, 6 figs., 1949. [Dutch summary.]

At the Biological Institute, São Paulo, Brazil, the symptoms induced by the viruses of tobacco mosaic and aucuba mosaic [? a strain of tobacco mosaic virus: see below p. 647] on *Solanum seaforthianum* leaves [cf. *R.A.M.*, 13, p. 648; 19, p. 721, *et passim*] were compared. Leaves inoculated with sap containing tobacco mosaic virus do not normally exhibit any primary symptoms, whereas the aucuba strain caused the development of numerous ring spot lesions, which increase with time and gradually impart a chlorotic aspect to a large part of the leaf surface. The secondary symptoms of the aucuba strain on the host consist largely of discrete, yellowish-white ring lesions, while secondary tobacco mosaic virus symptoms are restricted to diffuse veinbanding, malformation, and torsion of the young leaves.

Leaves incompletely 'premunized' [ibid., 28, p. 321] with tobacco mosaic virus and locally superinoculated with the aucuba strain display small, well-defined ring spots or yellow disks, the clear-cut borderlines of which stand out against the prevailing dark green of the leaf surface. In the corresponding leaves of non-premunized plants the ring spot lesions induced by aucuba mosaic are larger, more diffuse, and often without definite margins. Some time after inoculation the difference between the latter type of lesions and the originally unaffected portion of the leaf is barely noticeable. In *S. seaforthianum* leaves systemically premunized against the aucuba strain of tobacco mosaic virus, the ring spot lesions remain small and stand out against the predominant dark green of the leaf blade by reason of their sharply defined margins and clear colour.

In the concluding discussion an attempt is made to correlate the type of ring spot lesion in premunized leaves with the presumptive mode of virus multiplication in foliage previously infected with a virus strain antagonistic in its action to that of the superinoculated virus.

Bawden (F. C.) & Van der Want (J. P. H.). **Bean stipplestreak caused by a Tobacco necrosis virus.**—*Tijdschr. PlZiekt.*, 55, 3, pp. 142–150, 4 figs., 1949.

Stipple streak, a destructive disease of French beans (*Phaseolus vulgaris*) in peat soils between Amsterdam and Leiden [*R.A.M.*, 28, p. 44], has been found to be

due to a strain of the Rothamsted tobacco necrosis virus [ibid., 28, p. 208]. The two viruses are serologically related, crystallize in the same manner, and are composed of particles of similar sizes, but they differ in their effects on beans. The Rothamsted virus seldom spreads beyond the inoculated leaves, whereas the stipple streak strain diffuses through the plant, giving rise to necrotic symptoms. It also penetrates the stems and leaves of plants inoculated through the roots. On tobacco both viruses remain localized.

JONES (L. H.). **Soil temperature as a factor in the frenching of Tobacco (Nicotiana tabacum L.)**—*Plant Physiol.*, 23, 4, pp. 560–575, 4 figs., 1949.

At the Massachusetts Agricultural Experiment Station, Havana Seed tobacco plants were grown in a compost soil in a constant temperature apparatus. Frenching [*R.A.M.*, 28, pp. 7, 380 and next abstract] was induced at a soil temperature of 35° C., but did not occur at or below 21°. The symptoms of the disorder masked those of a tobacco mosaic virus with which half the plants were inoculated, but failed to impair its virulence. Frenching symptoms were not transmissible by the ordinary technique of inoculation.

The first indications of frenching are a pinhead chlorosis and a narrowing of the developing leaf. In one case they appeared as soon as eight days after the plants had been set in the apparatus, and in another as late as 58 days at 35°. Reduction of the soil temperature from 35° to 21° or below resulted in a progressive diminution to complete disappearance of frenching symptoms on the subsequent growth. In comparative experiments the Yellow Mammoth (cigarette) variety, obtained from Georgia, proved equally susceptible with the local Connecticut Valley Havana Seed (cigar).

Plants grown at a root temperature of 35° by solution culture technique did not develop frenching, and attempts to induce the condition by introducing into the nutrient solutions filtered water extracts from frenching soils were also unsuccessful. Mild symptoms were observed when iron was omitted from the solution. The onset of the disorder was delayed by the addition of borax to the soil and also by the maintenance of relatively low pH values. Air-drying of a soil destroyed its capacity to produce frenching symptoms, which were likewise mitigated on the new foliage by growth of the plants in a soil with a lowered average moisture content. Plant tissue tests for the nitrate ion gave positive results on frenched plants. The qualitative tests induced more intensive effects on frenched than on non-frenched plants, indicating that the former were capable of absorbing nitrogen but not of its total conversion into protein materials.

JONES (L. H.) & TIO (M. A.). **Unavailability of iron as a cause of frenching of Tobacco (Nicotiana tabacum L.)**—*Plant Physiol.*, 23, 4, pp. 576–594, 2 figs., 1949.

In further studies on the soil factors responsible for tobacco frenching [see preceding abstract], the dilution of soil with sand did not appreciably impair the ability of such dilutions to induce the disturbance at a soil temperature of 35° C. No symptoms developed in plants grown on whole sand or whole soil at 21°. Frenching was prevented by autoclaving sand and soil when the plants were grown at 35°, at which temperature the disease occurred on those in a non-autoclaved substratum. At 21°, however, non-autoclaved sand and soil did not induce frenching. The introduction of a small quantity of non-autoclaved into autoclaved soil restored the capacity of the latter to cause frenching at 35°, whereas the frenching tendency of non-autoclaved soil was not impaired by its inoculation with autoclaved. These results confirm a theory that at 35° the soil flora is competing with higher plants for one or more elements requisite for the growth of tobacco.

Tests made on disks of frenched and healthy leaf tissue floated on dilute solutions of major and minor elements gave positive results only with an iron salt solution. When peat mixtures of iron sulphate and iron phosphate were mixed with a frenching soil at 35°, symptom development was prevented in all the plants receiving the former compound and in those given the maximum amount of the latter. Chemical analysis of frenched and normal leaves revealed a marked discrepancy in their iron content. Normal leaves from plants grown at 21° contained nearly three times as much iron as those from corresponding cultures at 35°. It was further shown that the foliage of plants treated with the iron compounds contained a much larger quantity of the element than the untreated. The moisture content of frenched leaves and the osmotic concentration of the cell sap are higher than that of normal ones. The former were further characterized by a marked lack of tissue differentiation.

The results of the several experiments indicate that the high soil temperature of 35° stimulates a certain type of microbiological activity which disturbs the normal soluble iron content of the soil and leads to a deficiency of the element in tobacco plants. No support is lent to the hypothesis of a soil toxin, nor is any evidence forthcoming for the existence of a mineral deficiency.

Smith (K. M.). **Virus diseases of the Tomato.**—*J. Minist. Agric.*, 56, 3, pp. 119–122, 1 pl., 1949.

The symptoms, methods of spread, hosts, and control of the viruses commonly associated with the tomato plant in England are described. They are cucumber mosaic virus [*R.A.M.*, 26, p. 372], tobacco mosaic virus [loc. cit.] and its strains causing aucuba mosaic [ibid., 28, p. 208], stripe, and enation [ibid., 16, p. 727], tomato spotted wilt [ibid., 27, p. 113], tomato black ring [ibid., 28, p. 598] and tomato bushy stunt [ibid., 24, p. 479], also double virus streak (tobacco mosaic virus+potato virus X) and potato virus Y, neither of which occurs very frequently in this country.

Van Koot (Y.). **Enkele nieuwe gezichtspunten betreffende het virus van het Tomaten-mozaiek.** [Some new aspects of the Tomato mosaic virus.]—*Tijdschr. PlZiekt.*, 55, 3, pp. 152–166, 1 fig., 1 graph, 1949. [English summary.]

Experiments at Naaldwijk, South Holland, have shown that the development of fern-leaf symptoms in tomato plants suffering from tomato mosaic [? cucumber mosaic] virus [*R.A.M.*, 9, p. 417, *et passim*] is promoted by low light intensity, and to a lesser extent by an excess of nitrogen. No serological difference could be detected between the fern-leaf and mosaic viruses. There was also no evidence that a form of the disease known locally as 'strip', consisting of small, brown, necrotic spots on the leaves and fruit stalks, and irregular coloration of the fruits, are due to distinct virus strains.

Inoculation tests with heavily diluted tomato mosaic virus juice, e.g., at 1 in 100,000, showed that young tomato plants grown in subdued light and under warm, damp conditions are much more susceptible than those kept under full light and in a cooler, drier atmosphere [cf. ibid., 28, p. 208].

The extent of seed-borne infection by the tomato mosaic virus was shown to be very slight (0·1 to 0·2 per cent.), even when the seed was immersed for half-an-hour in infected juice the day before sowing. The elimination of the virus from the soil by means of chemicals appears to be impracticable. The relationship between the duration of heating and lethal temperature is expressed by the equation $(y-79)\sqrt{x} = 33$. The virus is totally destroyed by one hour's exposure to a temperature of 82·5° C., and adequate soil disinfection could probably be secured by thorough steaming of the upper 20 to 25 cm.

Hendrix (J. W.) & Frazier (W. A.). **Studies on the inheritance of Stemphylium resistance in Tomatoes.**—*Tech. Bull. Hawaii agric. Exp. Sta.* 8, 24 pp., 3 figs., 1949.

This is a full account of work carried out in Hawaii since 1943 to develop commercial tomato varieties resistant to grey leaf spot (*Stemphylium solani*) [*R.A.M.*, 26, p. 533; 27, p. 341]. Resistant lines, *Lycopersicon pimpinellifolium* and Targinnie Red [ibid., 22, p. 116], were crossed with locally adapted susceptible tomato varieties. The validity of the method of testing resistant reactions was demonstrated by a perfect correlation between cotyledon and mature plant reactions in both greenhouse and field and between inoculated and naturally occurring infections. Abundant sporulation was obtained *in vitro* by passing the pathogen through a susceptible host and then treating the re-isolated fungus with ultra-violet light. Analysis of 50 monoconidial isolates gave no evidence of physiologic specialization in the pathogen.

Of 987 F_1 hybrids from susceptible × resistant crosses 983 were resistant and in the F_2 701 of 943 were resistant. This closely conforms to a 3:1 ratio. F_3 hybrids were represented by 120 families, of which 36 were homozygous for resistance, 54 segregated, and 30 were homozygous for susceptibility. The data obtained indicated that resistance is governed by a single dominant genetic factor pair, to which the symbol 'Sm-sm' is assigned.

Osnitzkaya (Mme E. A.). Фитофтора Томатов в защищенном грунте. [*Phytophthora* of Tomatoes in protected soil.]—*Сад и огород* [*Orchard and kitchen garden*], 2, pp. 62–64, 2 figs., 1949.

During the last two years glasshouse tomato plants on farms in the Moscow area have been attacked by a new disease, caused by a species of *Phytophthora*, resembling most nearly *P. capsici* [*R.A.M.*, 20, p. 501]. In 1948, 60 per cent. of the tomato seedlings on the state farm '1st of May' were diseased and the number of infected state farms is increasing. Both seedlings and older plants are affected. The first symptoms on the green fruits are soft, pale spots, which quickly enlarge, forming characteristic grey to reddish-brown, concentric zones. The fruits, especially the lower part, are covered with abundant white mycelium, or with sporangia. The basal stem symptoms of young plants are similar to those of [potato] black leg [*Erwinia phytophthora*: ibid., 28, p. 354]; the stem becomes soft and thin and the plant dies. The infected upper part of the stem becomes dry and flat.

The optimum temperature for the growth of the fungus is 25° to 30° [C.], the minimum 10°. Besides potato, tomato, [chilli] pepper, and eggplant, it is pathogenic to melon and cucumber, and by inoculation to apple fruits.

All infected plants should be destroyed immediately the first symptoms are detected and the soil in the greenhouse changed or disinfected with chloropicrin, granosan, or formalin. To protect the fruits spraying with 1 per cent. Bordeaux mixture is advised. Mulching with straw is also an effective protective measure.

Mackay (J. H. E.). **The foliage symptoms of acute phosphate deficiency in young Tomato plants.**—*J. Coun. sci. industr. Res. Aust.*, 21, 4, pp. 247–251, 2 pl., 1948. [Received August, 1949.]

Symptoms of acute phosphate deficiency were observed occurring naturally on seedling Bonny Best tomato plants [*R.A.M.*, 28, p. 199] growing in brown clay loam at Canberra, either in the greenhouse or out-of-doors. The symptoms were reproduced readily on plants grown in phosphate-deficient nutrient sand cultures. Some discoloration resembled fungal spotting, but all fungi isolated from the spots proved to be non-pathogenic.

Seedlings subjected to conditions of extreme deficiency from germination made very poor growth, all aerial parts being stunted and purple, and the number of

leaves seldom more than three. At three to four weeks old the cotyledons, and later the foliage leaves, developed small, sunken, circular, brown areas either singly or in groups on the upper surface. These spots increased in size up to 2 to 3 mm. in diameter and often coalesced when they developed a leaden sheen and the area became necrotic. Spots were generally confined to the distal portion of the cotyledon, or to the central part, but were sometimes evenly distributed. From this stage the tissue between the spots died progressively from the tip to the base of the cotyledon: from seven to ten days after the spots first appeared the cotyledons died and were shed.

Symptoms appeared on the foliage leaves when die-back of the cotyledons was well advanced. At five to six weeks necrotic spots developed near the tip of the distal leaflet of the first foliage leaf. Die-back progressed and the leaf was shed approximately 14 days later. The second leaf also became involved but the third was seldom affected before the end of the experiments. A marked feature of the spotting was its zonate character. This was most clearly evident on leaves of almost mature plants grown in soil. The necrotic areas on these had the appearance of isolated lesions of early blight [*Alternaria solani*].

The severe symptoms described above were typical of plants given no phosphate or grown with 1·55 p.p.m. phosphorus. With double this quantity a longer time was required for the development of spotting, fewer leaves and cotyledons died and the plants made slightly better growth. When the level was again doubled there was a marked increase in growth but the lower surfaces of the leaves were still intensely purple and the plants small. At 15·5 p.p.m. the symptoms conformed to those reported under field conditions except that the cotyledons were blotched with purple. Plants receiving the full nutrient solution (31 p.p.m.) were normal in all respects.

In soil cultures the severity of the symptoms also diminished with increasing amounts of applied phosphate, but the differences between treatments were more pronounced than in the sand cultures.

Increasing applications of a deficient nutrient solution, although supplying a greater quantity of phosphate, did not cause any diminution in symptom development. The varieties Earliana, Gross Lisse, Jubilee, Pennheart, Riverside, Sioux, and Rutgers showed symptoms of acute deficiency identical with those described for Bonny Best. With Break o' Day, Marglobe, Vetomold (New Improved), and Pan America the symptoms were marked but atypical. It is suggested that tomato might be of use as an indicator crop to determine the phosphorus status.

Miller (P. W.), Bollen (W. B.), & Simmons (J. E.). **Filbert bacteriosis and its control.**—*Tech. Bull. Ore. agric. Exp. Sta.* 16, 70 pp., 15 figs., 1949.

This exhaustive account of bacteriosis (*Xanthomonas corylina*) [*R.A.M.*, 27, p. 166; 28, p. 273] of filberts (*Corylus avellana* and *C. maxima*) is based on work carried out in Oregon and Washington since 1930. The disease is known only in these two States; it is the only one of economic importance on the host. The symptoms of the disease [ibid., 15, p. 617], the morphological and cultural characters [ibid., 20, p. 40], physiology, pathological histology, and life-history of the causal organism, the development of epidemics, and the control of the disease are described. The disease has been artificially induced on leaves of the Turkish filbert *C. colurna*, which, however, appears to be more resistant than *C. avellana*. It is primarily a disease of the parenchymatous tissues, the vascular bundles being only occasionally invaded. At first intercellular, the bacteria later gain access to the cell lumen and develop intracellularly. Large cavities are subsequently formed which are filled with bacteria embedded in a slimy matrix.

The causal organism is introduced into the orchard on infected stock. Cankers on the larger branches and trunk are the chief sources of primary inoculum. Access

to the host is through stomata and wounds, and the presence of moisture on the host for a suitable period after inoculation is a prerequisite for infection. The minimal period of wetting necessary for infection varies with the age of the organs and the extent of water congestion of the tissues. Leaf infection occurred within one hour of wetting following inoculation when the leaves were young and the tissues water-soaked. A pre-inoculation moist treatment increased the incidence and extent of infection. Infection occurred between 7° and 25° C., and temperatures above 25° at the time of inoculation were rather more favourable to infection than lower ones. The incubation period was longer below 20° than above. As determined by leaf inoculations it ranged from eight to 13 days, depending on the age of the organ and the environmental conditions. In general, the younger the host organs and the higher the temperature, the shorter was the incubation period. The host organs pass through a stage of maximal susceptibility into a period of increasing resistance. They were most susceptible when young and succulent. The greater the number of sources of primary inoculum and the more frequent and abundant the rainfall during the period for infection, the greater the incidence. The occurrence of secondary infection was governed by the relative abundance of primary sources and the frequency and amount of rainfall during the infection period which extends from the time the buds are three-fourths grown (late summer) until they open the following spring.

The autumn is the most critical period in relation to control. Adverse growing conditions (particularly poor soil drainage, cold, sunscald, and drought) during the first few years of the life of an orchard predispose the trees to infection. In young orchards, autumn or winter planting of well-rooted, first-quality nursery trees in a deep, well drained soil, placing protectors round the trunks, using a disinfectant on all tools, and spraying with a bactericide greatly reduced tree losses. In older orchards, spraying or dusting was the only practical method of control. Of the sprays tested, home-made Bordeaux mixture (6–3–100) gave the cheapest and most effective control, while yellow cuprous oxide ($1\frac{1}{2}$–100) was almost as good. Copper dusts gave promising results in preliminary tests [ibid., 25, p. 372].

YOUNG (H. E.). **Axillary gall of Queensland Maple.**—*Qd J. agric. Sci.*, 5, 1, pp. 1–8, 5 figs., 1948. [Received August, 1949.]

Investigations into the cause of axillary gall of Queensland maple (*Flindersia brayleyana*), first observed in Queensland in 1927, showed it to be due to a bacterium closely allied to *Xanthomonas* [*Bacterium*] *tumefaciens*.

SCARAMUZZI (G.). **Resinosi dell'Olivo e possibile genesi della carie.** [Resinosis of the Olive and the possible origin of rot.]—Reprinted from *Olearia*, 7, 9 pp., 3 figs., 1949. [French and English summaries.]

The author reports studies on the phenomenon of 'gum-resinosis' of the olive (Petri, *Le malattie dell'Olivo*, pp. 54–58, 1915), caused by a resinous degeneration of the cambium or by some pathological activity of the perivascular tissues, and resulting in the formation of lysigenous sacs within the wood, with frequent exudation of resin. He tries to establish a correlation between this condition (the etiology of which has not yet been determined) and rot of the woody tissues. This rot is sometimes, but not always, associated with various fungi, including *Fomes fulvus* var. *oleae* [*R.A.M.*, 25, p. 508], *Stereum hirsutum* [ibid., 26, p. 88; 27, p. 207], and *Polyporus oleae*, which may at first perhaps be saprophytic on the rotting wood and later become parasitic.

In the author's opinion the sequence of events is gum-resinosis, drying-up and aseptic [non-fungal] breakdown of the wood, then dry rot. The final stage is quite compatible with an initially saprophytic action of the fungi associated with the dry rot. Further work is in progress.

WIEHE (P. O.). **Wilt of Calophyllum inophyllum L. var. tacamaha (Willd.) R.E.V. caused by Haplographium calophylli sp. nov. in Mauritius.**—*Mycol. Pap., Commonw. mycol. Inst.*, 29, 11 pp., 1 pl., 4 figs., 1 map, 1949. 3*s.* 0*d.*

The dying-off of *Calophyllum inophyllum* var. *tacamaha* or 'tatamaca' trees in the indigenous thickets and forests of the upland plateau of Mauritius, has occurred on a large scale since 1904 and it is believed that the same fungus here designated *Haplographium calophylli* n.sp., has been involved throughout.

The most characteristic external symptom is a wilting of part or whole of the crown, usually beginning at the distal end of the lateral branches. The leaves, which are normally glossy, lose their shine, curl inwards, gradually become bronze in colour, and dry out. Galleries of bark beetles occur on the trunk and branches of dead and dying trees, while the sapwood contains brownish streaks or strands due to tyloses in the vessels.

On rice cultures the conidiophores generally consist of a single hypha and usually one apical penicillus crowned with a mass of hyaline, spherical to oblong-cylindrical conidia measuring 3 to 5 by 1·5 to 3 μ. The fungus grew well on Wilbrink's medium in the laboratory at about 23° C. Fructifications were not observed on the host in nature.

Inoculation experiments were carried out in 1939 and 1946 by inserting fragments of a pure culture of *H. calophylli* growing on rice in the trunks of tatamaca trees at heights varying from 1 to 3 ft. from the ground. All of the inoculated trees died 15 to 17 weeks after inoculation. The fungus was reisolated from the sap-wood of several trees eight weeks after inoculation.

Further experimental evidence indicated that wilting in infected trees is brought about by the occlusion of the water-conducting vessels by the development of tyloses rather than by the secretion of toxins by the fungus.

Since bark beetles were always found associated with diseased trees, it is suggested that they play an important part in the dissemination of the pathogen from diseased to healthy trees. The frequent cyclonic storms may also be an important factor in its dissemination. Under conditions of natural infection arising from the twigs the rate of disease development is much slower than in inoculated trees, field observations indicating that a period of from six to ten months elapses between the appearance of the first symptoms of wilt and the death of the tree. No cases of recovery were observed in naturally or artificially infected trees.

Artificial inoculation with *H. calophylli* showed that the fungus can cause the death of *C. inophyllum*, *C. parviflorum*, and *Gaertnera psychotrioides*.

COOKE (W. B.). **Oxyporus nobilissimus and the genus Oxyporus in North America.**—*Mycologia*, 41, 4, pp. 442–455, 3 pl., 7 figs., 1949.

The author reviews the genus *Oxyporus* and gives a full description of *O. nobilissimus* n.sp. which was first collected in Oregon in 1943 within a few feet of the base of living *Abies procera* in Mt. Rainier National Park, Washington, where it was also found by the author in association with a brown rot of *Tsuga heterophylla*.

ALLEN (A. A.). **Invasion of a locality by Galerucella calmariensis L. (Col. Chrysomelidae).**—*Ent. mon. Mag.*, 84, 1005, p. 46, 1948.

In the summer of 1946, alders in a part of south-west Essex were affected by a disease; the chloroplasts were destroyed resulting in light brown, mottled patches on the leaves, which spread and coalesced, ultimately killing much of the foliage. As the outbreak coincided with an unusual attack by beetles (*Galerucella calmariensis*), and as the patches originated mostly from insect punctures, it is concluded that the disease is caused by a fungus or virus, and transmitted by *G. calmariensis*.

Blyth (W.). **Association of Gonatorrhodiella highlei with Nectria species.**—*Nature, Lond.*, 164, 4163, pp. 274–275, 1 fig., 1949.

During 1947, *Gonatorrhodiella highlei*, recorded in Great Britain only once before (*Trans. Brit. mycol. Soc.*, 3, p. 36, 1908), was found forming yellowish felts of conidiophores on the bark surfaces of stored beech [*R.A.M.*, 22, p. 185] and poplar logs at the Royal Botanic Garden, Edinburgh. On the beech *G. highlei* developed within the perithecial stromata of *Nectria cinnabarina*, a new host fungus, while on the poplar it sporulated freely from bark which yielded a fungus agreeing with varieties of *N. coccinea* in having a *Cylindrocarpon* stage.

In cultures from mixed conidial suspensions of the last-named fungus and *G. highlei* plated on extract agars of *Nectria*, *Trichothecium*, or *Trichoderma*, the effect of parasitism on *Nectria* hyphae was negligible.

Swingle (R. U.), Whitten (R. R.), & Brewer (E. G.). **Dutch Elm disease.**—*Yearb. Agric. U.S. Dep. Agric., 1949*, pp. 451–452, 1949.

After describing the distribution, symptomatology, and susceptibility of American elms to the Dutch elm disease (*Ceratostomella ulmi*) [see below, p. 653], the authors state that some recent resistant selections and hybrids show promise.

The prevention of breeding of the insect vectors [*Hylurgopinus rufipes* and *Scolytus multistriatus*: cf. *R.A.M.*, 27, p. 30] in dead wood may be achieved by burning or by thorough spraying with No. 2 fuel oil containing 1 per cent. of DDT. In living trees the beetles can be controlled by covering the bark surface with an emulsion-type spray containing 2 per cent. of DDT; this produces residues which remain effective for more than three months. Further experiments with DDT sprays are recommended.

Gravatt (G. F.) & Parker (D. E.). **Introduced tree diseases and insects.**—*Yearb. Agric. U.S. Dep. Agric., 1949*, pp. 446–451, 1949.

Chestnut blight [*Endothia parasitica*: *R.A.M.*, 28, p. 553] threatens to put an end to the tannin industry in the United States, the main source of which has been the American chestnut [*Castanea dentata*], alive or dead. The fungus also causes considerable damage to post oak [*Quercus stellata*], but no other oak species appears to be seriously affected.

Blight-resistant Asiatic chestnuts and their hybrids with the American chestnut, though mostly less straight-stemmed, less frost-resistant, and more particular in their soil requirements than the American, when planted on suitable sites will yield abundant sweet nuts and produce trees suitable for small telephone poles. Blight was almost completely eliminated by prompt eradication measures from chestnut plantings on the Pacific coast [ibid., 28, p. 563].

White bark pine [*Pinus albicaulis*: ibid., 28, p. 259] and several other high-altitude species of white pine will probably be killed in the future by white pine blister rust [*Cronartium ribicola*: see next abstract] because it is uneconomic to remove the numerous wild gooseberries and currants growing in their vicinity.

Increasing and more widespread aeroplane traffic is responsible for greater numbers of living parasites reaching the United States. In 1948, 57,756 aeroplanes arrived at 47 ports of entry and prohibited material was found on 26 per cent. of them; 3,500 interceptions of insects and plant diseases were made. When, however, the usual ports of entry are closed, planes may land where there are insufficient inspection services; illegal flights are not inspected at all. In 1948, 24 per cent. of ship inspections disclosed prohibited material, and during a special survey from 1943 to 1945 17 plant pathogens foreign to the country were intercepted. The vital importance of preventing new introductions of pathogens, particularly those of trees, which require such a long period before they can be replaced, from becoming established is emphasized.

Martin (J. F.) & Spaulding (P.). **Blister rust on White Pine.**—*Yearb. Agric. U.S. Dep. Agric., 1949*, pp. 453–458, 1949.

The introduction, spread, economic importance, and control of blister rust [*Cronartium ribicola*: see preceding and next abstracts] in the United States are described; the disease affects all eight native species of white pine. The control area now totals about 28,000,000 acres; the disease is under control on nearly 12,000,000 acres and the initial phases of control have been applied to an additional 11,000,000. On the whole, the outlook for the ultimate control of the disease in selected areas is favourable [see above p. 631].

Clapper (R. B.) & Miller (J. M.). **Breeding and selecting pest-resistant trees.**—*Yearb. Agric., U.S. Dep. Agric., 1949*, pp. 465–471, 1949.

The methods of breeding and selecting disease-resistant trees are briefly described and the progress that has been attained in this field is reported. Several *Pinus lambertiana* trees have withstood infections from blister rust [*Cronartium ribicola*: *R.A.M.*, 28, p. 258] for 14 years and will be used as breeding and propagating material [ibid., 28, p. 148]. The following foreign species (which, however, have no timber value) were found to be resistant to the disease: *P. cembra* var. *helvetica*, *P. armandi*, *P. griffithii*, and *P. koraiensis*.

In a breeding programme started in 1937 for elms resistant to Dutch elm disease [*Ceratostomella ulmi*: see above, p. 652], of the few hybrids obtained from about 20,000 crosses between American and Siberian elm [*Ulmus pumila*] one has resisted repeated inoculations with the fungus. Some resistant European elm species imported in 1939 have retained their high degree of resistance, but they grow less rapidly than the American elms.

Young (H. E.). **Rhizoctonia root rot of Hoop Pine.**—*Qd J. agric. Sci.*, 5, 1, pp. 13–16, 1948. [Received August, 1949.]

During April, 1935, several two-year-old hoop pines (*Araucaria cunninghamii*) were affected by root rot in the forest nursery at Googa in the Brisbane Valley, southern Queensland, caused by a species of *Rhizoctonia* [*R.A.M.*, 15, p. 281]. There was no further spread after the beds and paths had been treated with Cheshunt mixture. In the same district several dead plantation trees, which had been taken from the nursery two years before, exhibited the same symptoms as the nursery trees. The same fungus, later identified as a strain of *R. crocorum* (perfect state probably *Helicobasidium compactum*) [ibid., 18, p. 503], was found on nursery plants at Kalpowar and Kilkivan in southern Queensland and at Atherton in northern Queensland. At Yarraman, southern Queensland, several deaths following transplanting from the seedling beds (at 12 months) into drills in the transplant beds were found to be associated with the same fungus. The greatest losses (up to 10 per cent.) occurred at the Brooyar nursery, Kilkivan, where infection appeared in transplants which had been moved four months before.

Cheshunt mixture at the rate of 1 gal. per sq. yd., was applied to observation plots in affected beds in the Brooyar nursery. Counts made on the treated and untreated plots seven months after treatment indicated that a loss of nearly 10 per cent. had been prevented, and that, following the first observation made four months after treatment, there was no further development of the trouble. Routine treatments have confirmed the efficiency of this mixture in controlling the disease. No foliage injury has been caused and the use of the fungicide at four times the normal strength had no deleterious effect on growth.

The recovery of some plants indicated that the onset of cooler winter weather in May probably assists the plants in their resistance to the trouble. Experiences at the Yarraman nursery indicated that the disease appears to affect weakened plants to some extent.

Young (H. E.). **Hendersonula agathi n.sp., the cause of leaf cast of Kauri Pine in Queensland.**—*Qd J. agric. Sci.*, 5, 1, pp. 9–12, 2 figs., 1948. [Received August, 1949.]

In 1936, Kauri pines (*Agathis palmerstoni*) in forest nurseries and plantations in northern Queensland were found to be affected by a fungus disease causing injury to the leaves and twigs and severe defoliation [*R.A.M.*, 18, p. 503]. The disease was completely controlled in the nurseries by applications of Bordeaux mixture (4–4–40). The same disease was observed to cause unimportant injury on naturally occurring Kauri pines in rain-forests in this area. It was later found in plantations and on indigenous *A. robusta* in southern Queensland, has appeared on nursery stock of this species with sufficient severity to warrant the use of control measures, and isolations have been made from lesions on *A. australis*.

The initial symptoms are necrosis and wilting of the leaves, which eventually die and are shed. They are marked by progressively enlarging necrotic areas with well defined edges, which may be restricted to irregular patches or eventually cover the whole leaf. In very severe cases the twigs and smaller branches also wilt and die. Black pycnidia occur on the upper surface of dead leaf tissue and on the bark of affected twigs. On the latter, elongate-oval 'blisters' with longitudinal fissures filled with chains of black thallospores are sometimes found.

Isolations from affected tissues and cultures from spores obtained from the pycnidia and blisters yielded in all cases a dark Sphaeropsid, designated as *Hendersonula agathi* n.sp. On potato dextrose agar it grew readily and formed a white, woolly mat which, after several days, became dark olive-green and eventually olive-black. No pycnidia were formed. The fungus grew profusely over the surface of sections of sterile Kauri pine branches in tubes and in three months pycnidia developed partly immersed in mycelial aggregates on the surface of the bark.

The single, spherical pycnidia occur immersed in or erumpent from black stromata and measure about 300 μ in diameter and have a short ostiole. Sometimes they are irregularly shaped and may be laterally compressed. The hyaline spores inside the pycnidia measure 13 to 18 by 5 to 6 μ. After extrusion the majority are 3-celled and measure 13 to 20 by 6 to 8 μ, the central cell being brown and the end cells hyaline. The thallospores are rarely uniseptate, hyaline at first and dark brown with age, and globose (3·5 μ in diameter) or oblong (8 by 3·5 μ). Pure cultures from thallospores caused typical leaf cast disease in Kauri pine. No thallospores were produced in pure culture.

Rishbeth (J.). **Fomes annosus Fr. on Pines in East Anglia.**—*Forestry*, 22, 2, pp. 174–183, 2 pl., 1948.

A root disease of pine, caused by *Fomes annosus* [*R.A.M.*, 17, p. 714], first reported by Macdonald (*Forestry*, 13, pp. 1–18, 1939), has recently caused serious losses in Forestry Commission pine plantations in two areas of East Anglia, both having sandy soils and low rainfall. On former woodland sites and areas replanted after fires young trees are often killed soon after replanting. On the other hand the disease has appeared on former arable and heath sites only after the first felling. The most serious outbreaks occurred in young plantations after thinning. The trees die in groups, often circular, which are sometimes 30 yds. in diameter. The pathogen was found in old tree stumps (usually conifer, but also birch and occasionally oak and gorse) on every site where the disease has developed. Invasion of healthy, living roots proceeded in every case from contact with infected ones. The first trees to be killed are always infected by contact with stump roots, and infection is then transmitted to neighbouring trees by root contact, which may take place from about the eighth year onwards. Crown symptoms appear relatively late by which time the roots are heavily infected.

Investigations showed that *F. annosus* does not live in the soil, but is confined to woody tissues. It grew readily on sterilized natural substrates, but growth on unsterilized materials was prevented mainly by *Trichoderma viride* [ibid., 27, p. 83], which is antagonistic to the fungus and often kills and replaces it in the wood, especially in acid soils. Other fungi in stumps which were antagonistic to *F. annosus* were *Hypholoma fasciculare*, *Peniophora gigantea*, and *Penicillium* spp.

On sites on which no stumps have previously existed, infection was found to take place by air-borne spores which readily colonize freshly exposed stump surfaces. Infection was present at first in a thin wedge of wood extending downwards to just below soil level, and spread later to the inner surface of the bark and along the lateral roots away from the stump. Creosoting the surfaces of cut stumps reduced the incidence of infection. Infection of freshly cut stumps was highest from January to April and in late summer. It is suggested that *F. annosus* becomes established in stumps within a few weeks of felling and that colonization of the cut surface after a longer interval is prevented by competing fungi. The fungus is more frequent in large stumps than in small ones of the same age. The average growth rate of the fungus in stump roots is about 1 m. per year; it is often found in large stumps 15 years after felling and is sometimes still present after 30 years.

Any part of the root surface may be attacked, and it appears healthy and sound at the time of infection; the progress of infection varies with the size of roots and the type of soil. The disease is more serious in alkaline soils than in acid ones, where fungal competition is more intense and where the roots resist infection vigorously by resin production and cell division. It also tends to be severe where soils are deficient in surface organic matter.

The control of the disease is extremely difficult once the fungus is established below ground. Early felling of 'wolf' trees on alkaline soils, the removal of trees at an early stage, and extensive burning on former woodland sites should be avoided. The confining of thinning operations to early summer may reduce the incidence of the disease, and creosoting or painting stump surfaces immediately after felling is especially recommended to prevent infection by air-borne spores.

Gernlein. **Zum Lärchenabbau in Nordwest-Deutschland.** [On the deterioration of the Larch in north-west Germany.]—*Forst u. Holz*, 3, 20, pp. 193–195, 1948.

The widespread deterioration of the larch in north-west Germany is attributed to the use of seed of Alpine provenance, which is inferior to that of Sudetic origin, not only in growth habit and specific gravity of the wood but also in its susceptibility to canker [*Dasyscypha willkommii*: *R.A.M.*, 17, p. 360], the most important point of all. Moreover, by reason of their natural habitat at an altitude of 350 to 650 m., Sudetic larches are more readily acclimatized in the north-western plain than those from the Alps (1,400 to 1,500 m.). An illustration of this argument is afforded by a forest near Helmstedt, which contains well-grown, canker-free, 80- to 200-year-old trees, descendants of those raised from Sudetic seed imported from Silesia in the middle of the 18th century; a 40- to 80-year-old lot of unknown (probably Alpine) origin, nearly all of crooked growth and badly cankered; and young (up to 40-year-old), slender, straight, and healthy trees grown from seed of the original Sudetic introductions.

Day (W. R.). **The relation between soil conditions, type of ground vegetation, and the growth of trees.**—*Forestry*, 22, 2, pp. 184–194, 1948.

Young forest trees in various parts of Great Britain growing in shallow soils under relatively adverse soil conditions, suffer from a chronic chlorosis due to the competition of the ground vegetation. Sitka spruce (*Picea sitchensis*), larch (*Larix*

decidua), and Norway spruce (*P. abies*) appear to be more susceptible than Scots pine (*Pinus sylvestris*). The disorder can be relieved by suppression of the ground flora, particularly turf and tussock grasses and *Calluna vulgaris* heath either by mulching, ploughing, or other form of cultivation, or by mixing the susceptible species with less susceptible ones.

Observations of larch trees in Darnaway Forest, Morayshire, Scotland, indicated that while trees five or six years old in pure plantings were markedly affected, those in adjacent plots interplanted line by line with Scots pine were healthier, and their growth rather more vigorous. In one compartment of three examined, the incidence of canker (*Dasyscypha*) [*willkommii*: *R.A.M.*, 27, p. 503; cf. preceding abstract] was significantly lower in the mixed planting than in the pure planting. In older plots (planted 1938) there was a significant association between mixed growth and freedom from [unspecified] die-back.

It appears that the limited volume of soil available for rooting and especially the water/air balance in that space are of great importance in determining the development of the chlorosis. Examination by Dr. Levisohn showed that trees in check had very few and poorly developed mycorrhiza, although the appropriate mycorrhizal fungi were not absent from the area.

Gottlieb (S.) & Geller (J. H.). **Enzymatic decomposition of lignin.**—*Science*, 110, 2851, pp. 189–190, 1949.

Studies were carried out at the University of Maryland to examine the ability of micro-organisms to utilize isolated lignin and the possible existence of lignin-oxidizing enzymes. Good growth of several species of wood-rotting fungi [unspecified] was obtained after two weeks' incubation on media in which lignin (prepared from red spruce wood) was the limiting carbon source. A dry, stable preparation of lignin-oxidizing enzyme was obtained from commercial spawn of mushroom (*Agaricus* [*Psalliota*] *campestris*), which was found to be a reliable source of the enzyme. The latter buffered to pH6 for activity measurements, is quite stable in acid solution (pH4 to 6·5), but is rapidly inactivated at pH values higher than 7. The optimum activity is at 5·7 to 6, with a temperature optimum close to 40° C. Under optimum conditions the activity of the enzyme solution is proportional to its concentration.

Statutory Instruments, 1949. No. 1693. Destructive Insect and Pest Acts, England. The Importation of Plants (Amendment) Order of 1949.—1 p., 1949.

This Order, superseding Importation of Plants Order of 1947 (*b*) [*R.A.M.*, 27, p. 448] and effective as from 15th October, 1949, provides for the amendment of the form of certificate of health accompanying plants imported into England and Wales from abroad by the deletion from Paragraph (4) of Article 5 of the words 'the genus *Ulmus*' and their substitution by the words 'the genus *Castanea* or of the genus *Populus*'.

Statutory Instruments, 1949, No. 1692. Destructive Insect and Pest Acts, England. The Importation of Forest Trees (Prohibition) Order of 1949.—2 pp., 1949.

This Order, coming into operation on 15th October, 1949, prohibits the importation into England and Wales of trees of the genera *Castanea*, *Abies*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga*, *Sequoia*, *Thuja*, and *Tsuga*, except for instructional, scientific, or other approved purposes. The Importation of Elm Trees and Conifers (Prohibition) Order of 1933 (*c*) and The Importation of Elm Trees and Conifers (Prohibition) (Amendment) Order of 1935 (*f*) [against *Ceratostomella ulmi*: *R.A.M.*, 14, p. 735] are hereby revoked.

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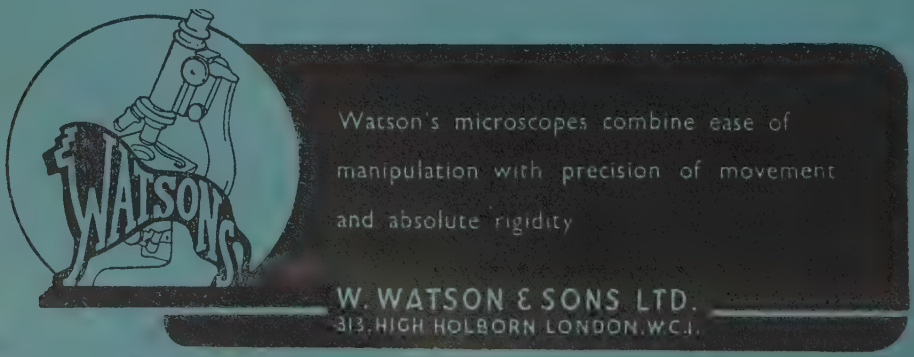
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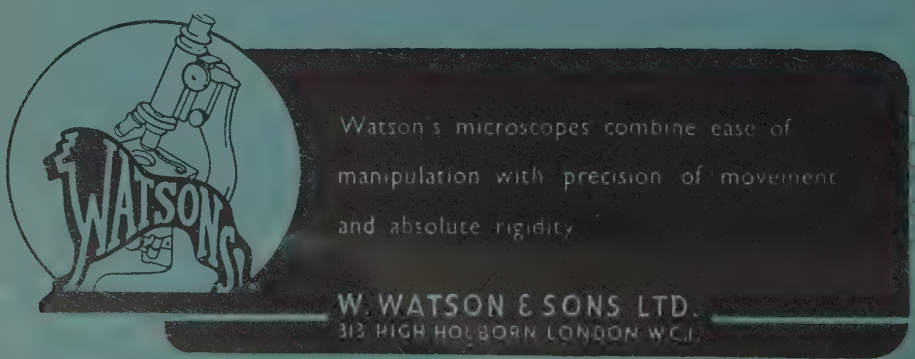
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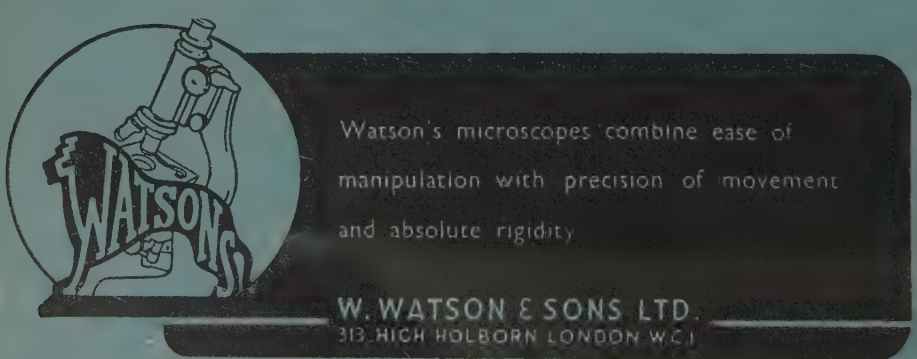
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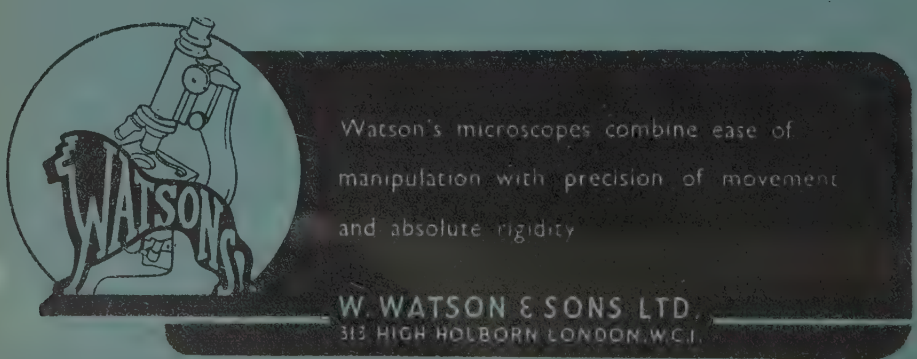

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